Tamkang University

淡江大學

Graduate Institute of Futures Studies

Spring 2021

Anticipating Future Scenarios for Sex Robots
探索性機器人的未來可能情節與其倫理意涵

Emily Natalie Jaworski

Tam Kang University, emilyjaworski@gmail.com

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https://www.airitilibrary.com/Publication/alDetailedMesh1?DocID=U0002-0407202112050000

DOI: 10.13140/RG.2.2.35480.47366

Anticipating Future Scenarios for Sex Robots

By Emily Natalie Jaworski, 2021
Advisor: Jeanne Hoffman
Graduate Institute of Futures Studies, TamKang University

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ENGLISH; MANDARIN (中文); KEYWORDS

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Dedicated to my family,
my thesis advisor, & MOS Burger
for always being there.

Anticipating Future Scenarios for Sex Robots (Thesis Version)
探索性機器人的未來可能情節與其倫理意涵

Emily Natalie Jaworski

Graduate Institute of Futures Studies, TamKang University

Abstract:

At the intersection of social robotics and sex technology, sex robots occupy a unique position within both fields. Sex robots are the only domestic robots where there is a financial incentive to make the robot as life-like as possible, while few other sex devices inspire true scorn and ethical debate. Today's sex robots are rudimentary, they are not nimble, nor can they walk on their own. The “AI personalities" sex robots are outfitted with are akin to smutty versions of the personal assistants found in most smart phones. However, looking twenty, thirty, years down the line, things could shift dramatically for this technology. There is already literature suggesting alternative applications for sex robots, within the fields of healthcare and therapy. Yet there are no clear standards or oversight when it comes to security, privacy, and responsibility within the sex tech industry. In addition, there are campaigns to ban this technology altogether. These factors convene to create an atmosphere of uncertainty surrounding the future of this emerging technology. This paper aims to provide useful insight into a variety of possible outcomes for sex robot technology, by applying the Futures Studies method of scenarios. Four scenarios were created using the Four Archetypes, also known as the Manoa Method, as developed by Jim Dator. These scenarios were informed by primary data collected via interviews and reinforced with existing secondary data from published academic literature. The four scenarios are: *Continued Growth* - focused on money, growth and capitalism, many job opportunities are created, as are the risks for exploitation. *Discipline* - a security-minded society and regulatory environment, where sex robots are clinical tools for providing sexual therapies. *Collapse* - a future where sex robot technology has been globally prohibited, and back-casts events leading up to this ban. *Transformation* – a community-oriented society open in sexual attitudes, which recognizes the holistic importance of sexual wellbeing over fleeting sexual needs and momentary gratification. Furthermore, a consumer study was done that reveals insight to the needs of potential sex robot owners and disabled users. These scenarios will be useful for manufacturers, policy makers, consumers, researchers, and even those who campaign against sex robots.

摘要:

在機器人社會與性技術的交匯處，性機器人在這兩個領域都佔據著獨特的位置。性機器人是唯一有經濟誘因使家用機器人盡可能栩栩如生的家用機器人，而且很少引起真正的蔑視和道德爭論。當今的性愛機器人很初級，它們並不敏捷，也不能自己走路。性機器人配備的 AI“個性”類似於我們在智慧設備中發現的 個人助手的淫穢版本。但是，如果再經過二十、三十年，該技術可能會發生巨大變化。已有文獻提出性機器人在治療和保健中的替代應用。然而，在性技術行業中，在安全性、隱私和責任方面尚無明確的標準或監督。另外，尚有許多倡議 完全禁止這種技術。這些因素共同構成了圍繞這一新興技術的不確定氣氛。本文旨在透過應用情節的未來研究方法，為該新興問題的各種可能結果提供有用的見解。運用訪談和問卷調查方法收集原始資料，並使用已發表的學術文獻和文章中的現有資料進行了增強。並使用夏威夷大學所創 Manoa 原型情節建構法，提出四個可能未來情節。這四個情節是：持續增長-主要集中在貨幣，增長和資本主義上，創造了許多就業機會。甚至連駭客都是出於經濟動機。紀律-一個安全意識濃厚的社會，一個監管環境，性機器人診所在其中提供各種性療法的工具。崩潰-在全球範圍內禁止性愛機器人技術的未來，並發佈導致此禁令的事件。轉型-一個對性觀念持開放態度的社會，認識到性健康

對於短暫的性需求和短暫的滿足感具有整體重要性。此外，進行了一項消費者研究，以收集殘疾用戶對性機器人的態度及其設計需求。這些場景對於製造商，政策制定者，消費者，研究人員，甚至是那些反對性機器人的人都是有用的。

Keywords:

sex robot, sex doll, therapeutic use, alternative application, healthcare, disability, scenarios, prostitution, HRI, relationships, design, sexual attitudes, regulation, cybersecurity, internet of things, causal layered analysis,

Chapter 1. Introduction

From VHS tapes to VR haptic development, the on-going pursuit to replicate and elevate the sexual experience has often placed the sex industry at the forefront of technological advancement (Johnson). Sex robots are no different. At first glance, the sex robot may seem like a novelty invention, a niche subject unworthy of serious research and consideration. However, we would be remiss to overlook this technology simply for having a taboo origin. No other industry is working harder to produce fully functional, life-like, humanoid robots with multi-faceted, complex personalities. Looking at the latest iterations of sex robots, one can see that they are coming quite close to finally making their way out of the fated Uncanny Valley.

This intersectional technology merges the fields of sex tech, and domestic robotics in a way that pushes the boundaries of both industries. While many sex devices replicate the physical sensations experienced during the sex act, sex robots replicate the act of intercourse with another body. While robotics is booming, no other sector has a financial incentive to deliver details like varying eyelash lengths, arm hair and body warmth. In addition, few technologies inspire such fervor. There are many campaigns against the mere existence of sex robots. Rarely are technologies brought to this extreme in the court of public opinion, with the exceptions of human cloning, or nuclear weapons. Others use sex robots as a lens to frame discourse on deeply embedded social constructs like consent, gender power dynamics, and even the nature of human intimacy.

Development of the sex robot industry has exploded within the past few years, sparking heated debate, hope and terror (Shen). Hope for new medical and therapeutic applications; terror and disgust at the potential ramifications for gender relations. The Campaign Against Sex Robots is calling for an outright ban against development of this technology within European nations. The International Love and Sex with Robots Conference struggles to meet annually, due to conflicts with their hosts and threats from local communities (Owsianik, 2015). "Robot brothels" dot the globe, inciting protest, public action and political involvement (Tallet; Katz).

While only commercially available since 2017, conceptually, sex robots have long challenged ideas about human intimacy and consent within ethical debate (Döring, et al., 2020). Arguments against sex robots usually center on negative gender stereotypes and imbalanced power dynamics (Richardson, 2018). Proponents of human-robot relationships consider sex robots to be an elevation of human sexuality that may provide an opportunity to bring intimacy to those who have previously been socially excluded from experiencing it (Levy, 2009). These discussions bring up many immediate contradictions and paradoxes. For example, it has been argued that sex robots will contribute to creating more victims of sexual violence by conditioning potential offenders to bypass consent (Richardson, 2016; Sparrow, 2017). It has also been suggested that sex robots could help *treat* victims of sexual violence, or rehabilitate past offenders (Eichenberg, et al.). Some say sex robots will further exacerbate human loneliness and erode one's capacity for empathy (Richardson, 2018); others say that sex robots with advanced AI could help people feel companionship and learn the social skills to form better human relationships (Döring, 2021; Fosch-Villaronga & Poulsen, 2020, 11).

1.1 Aim

These contradictions are precisely why it is valuable to place this subject within a Futures Studies framework. Futures studies is predicated on exploring multiple outcomes and listening to different voices. By applying scenarios, we are able to see how different claims may play out without making a normative argument in favor of either stance. The following research investigates both positive and negative potentials of sex robot proliferation, such as therapeutic applications and security risks. This paper aims to explore issues, opportunities, and risks that have been given legitimate consideration or have yet to be uncovered. This will be achieved through a research strategy of data collection via interviews and consumer studies with a variety of stakeholders, alongside an analysis of the current industry. A thematic analysis of this data will be used to generate scenarios. Using a Causal Layered Analysis (CLA), opportunities for social change are discussed through the lens of sex robot technology.

Scenarios and CLA are both tools used within Futures Studies to depict alternative futures. They are not tools for predicting the future *per se*, so much as opening the present to new directions and possibilities (Inayatullah, 2005). The findings of this paper should be valuable to either side of the discussion and could be used by those who argue against sex robots, or are in favor of them, by providing context for concerns that may arise.

Research Questions

> What are future alternative applications for sex robots, beyond consumer sexual gratification? How can sex robots be detrimental or beneficial to different industries, groups, or actors?

Method

The research strategy for this thesis project is to collect primary and secondary data in order to form scenarios, based on the Four Archetypes as developed by Jim Dator (Dator, 2009). These scenarios will then be analyzed using a Causal Layered Analysis (CLA), developed by Sohail Inayatullah (Inayatullah, 1998). The primary data will be collected in the form of semi-structured interviews with stakeholders on both sides of the sex robot debate. Thoughts and Opinions on Sex Robots from the Disabled Community will also be collected through an online questionnaire distributed to sex positive discussion forums specifically oriented to disability issues. Secondary data will be collected from existing literature, internet sources, and newspapers to provide supportive context for themes extracted from the interview analysis. Using these themes, potential drivers of change will be identified as factors. These factors are then placed within the context of the archetypal narratives to create scenarios. Finally, a Causal Layered Analysis will be used to discuss the scenarios.

1.2 The Sex Robot

The rest of the introduction will be left to defining sex robot related terms, a brief history of sex robots, and a description of models currently available on the market.

1.2.1 Definition of terms

Let us begin by outlining a clear definition of a sex robot, and how they differ from a sex doll.

- A *sex robot* is a life-sized human figure designed for the purposes of sexual gratification, with animatronic features such as facial expressions, vocalizations, and limbic movement. Some sex robots have AI-driven "personality" features, the inclusion of which is not necessary to be defined as a sex robot. *Gynoid* is a term used to designate a humanoid android or robot specifically depicting the female form. The majority of today's sex robots are gynoids.

- A *sex doll*, also known as a love doll or real doll, is a life-sized human figure with penetrable orifices made for the explicit purpose of sexual gratification.

Sex robots can be thought of as enhanced versions of sex dolls and are differentiated by their mechanical features. Sex robots and sex dolls are closely related, often coming from the same manufacturers, struck from similar molds, and made from the same materials. Due to these similarities, the terms are unfortunately used almost interchangeably, especially in the media, which can lead to some confusion[1]. While the humanlike aspect of sex robots may change in the future, the present-day social construction behind the word 'sex robot' refers to an anthropomorphic machine.

The first sex robot was first developed in 2010 by engineer Douglas Hines of New Jersey-based sex doll manufacturer True Companion. The prototype model, named Roxxxy, debuted at the sex industry conference, AVN Adult Entertainment Expo, held each year in Las Vegas, Nevada (Hornyak). Roxxxy boasted a variety of personality types with names such as "Wild Wendy" and "Frigid Farrah". With 6 personality types in total, the robot was reported to be able to hold basic conversations with users and was lined with sensors that would respond to their touch (ibid.). Since then, sex robots have continued to be produced by solo enthusiasts and manufacturing companies alike, on multiple continents.

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[1] See Table 1 Misreported Sex Robot Headlines in News Media

1.2.2 Current Models in Production

As of this writing, there are three verified companies which produce sex robots available for consumer purchase:

- Realbotix, under parent company Abyss Creations, is based out of California and produces a line of sex robot models under the name Realdoll-x: 5 different ready-to-ship female models, and a prototype for one male. The Realdoll-x line started with their flagship robot Harmony, with a robotic head capable of facial movements and speech powered through an "AI engine". This software controls personality, voice, and other virtual features, that are customized by the user through an app via smart device. Abyss Creations is also the premiere sex doll manufacturer in the United States through their subsidiary Real Dolls. The company also sells robot heads that can be combined with most body types of their Real Dolls products. Harmony and her kin have a reported price point of $5,000-$7,000 USD (Abyss Creations).

- Emma is produced by Chinese company Shenzhen All Intelligent Robot Technology Ltd, under the firm Ai-Ai Tech (with partner companies Japan DMM and robotics manufacturer Japan HiBOT), and is distributed in the United States, Australia and Europe via UK company DSDoll Robotics (EFE-EPA). Emma's reported functions include temperature-controlled skin, limbic movements, blinking and simulated breathing. She can also emote facial expressions, respond to voice commands, and hold conversation in English and Chinese, according to Ai-AiTech's English distribution website (ai-aitech.co.uk). The price point for a pre-assembled or bespoke robot, with and without AI functionality is £2,799.99, or $3,850 USD.

- Also out of China, is EXDOLL's Xiaodie. According to an AFP interview with the company's marketing director, Xiaodie features an animatronic armature, responds to voice commands, and has a virtual assistant technology comparable to what is found in most smartphones (Pleasance). Her Wi-Fi functions allow her to go online to retrieve information and manage appliances paired to the same Wi-Fi network. Like Harmony, Xiaodie's personality program is managed through a companion app. The sex robot costs ¥25,000 CNY, or $4,000 USD.

There are also two sex robot models no longer in production that are worth mentioning, due to the significant public attention they received, both in the media and academic writing.

- Synthea Amatus's sex robot Samantha was the public facing model for the Barcelona-based company. She is capable of speech and equipped with vibrating body parts and sensors that respond to touch. Samantha's inventor, Dr. Sergi Santos, designed the robot's software and created the robots with his wife, who assembled the hardware and inserted the robotic armatures. Santos demonstrated that Samantha has the capacity for learning how to precisely respond to a user's sexual tendencies over time and predict when they will achieve orgasm (BBC Three). Samantha gained notoriety in the media for being the sex robot with the capacity to "give consent". This is due to Samantha's programming to occasionally behave as if she is "not in the mood" and needs to be wooed or warmed up to perform (Miley). Samantha also featured a "family mode", for child-friendly conversation (This Morning). While Samantha was the most sophisticated robot of its time, Synthea Amatus no longer produces sex robots for the public. This is precisely due to the overwhelming media attention the robot and its makers received, that often bordered on harassment (Santos). When in production, their robots had an average price point of $4,000 USD and could operate offline.

- Roxxxy and Rocky were products marketed by True Companion. As mentioned, Roxxxy was the first sex robot known to be manufactured and debuted in 2010 at AVN, an adult entertainment and technology conference. According to True Companion[2], the latest model RoxxxyGold was outfitted with these six personality settings:

  -*Wild Wendy* - the adventurous personality
  -*S&M Susan* - “ready to make your secret desires become reality”
  -*Mature Martha* - Matronly, prefers talking
  -*Young Yoko* - naïve and curious with “an 18+ year old personality” [sic]
  -*Frigid Farah* - reserved, does not like to engage sexually
  -*Roxxxy* - Neutral personality, based off customer interaction

  These personality settings drew a lot of scrutiny, particularly Frigid Farah and Young Yoko, which some argued allowed men to simulate rape (Timmins). However, there has not been a verified consumer purchase of a functioning sex robot from True Companion. At the time of this writing, True Companion's website is no longer operational, though a late 2018 archive of the site lists both Roxxxy and Rocky for $9,995 USD each.

Chapter 2. Literature Review

The literature review is an account of how sex robots have been received thus far, socially, politically, and economically. It also provides background knowledge on how the topic has been discussed in academic literature, and some of the potential applications for this technology. In this way it provides a story in two parts: the present and the future.

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[2] via the Internet Wayback Machine archive, date of archival access: 09 Nov. 2018. See *True Companion* in works cited

The first half of the literature review measures the social response to sex robots. It begins by discussing the global consumer market and how sex robot brothels have disrupted communities and local sex work economies. From there, we will look at instances where sex robots and sex dolls have brought on legal rulings and considerations. This will lead to an outline of the points made by critics, focusing on the principles and goals of the Campaign Against Sex Robots. We will then move on to proponents of sex robot usage, by discussing work done in the field of Human Robot Interaction, and the International Love and Sex with Robots Conference. This first half concludes with an overview of the current state of cybersecurity within the sex tech industry, as it relates to the future of this technology.

The second half of the literature review will cover academic speculation on sex robot usage and gather instances where the technology has been regarded from an alternative stance, that is, beyond the purpose of consumer gratification. This second half of the literature review will serve as partial context for the thematic analysis, alongside any findings from the interview transcripts and questionnaire.

2.1 Industry Growth and Public Reception

2.1.1 Western Markets

The sex tech industry is estimated to be worth about $30.6 billion USD (Elijah, et al.), and valued to reach nearly $40 billion by 2024 (PRNewswire). While a wider variety of sex devices are geared towards female consumers, higher priced items such as robots and sex dolls, are predominately purchased by males (Szczuka & Krämer). Public reception towards sex robots has been small, but significant, as evidenced by polls and media headlines.

According to public opinion polls in the United States, the United Kingdom, and Europe, interest in sex with robots has been increasing over the past ten years (Fig. 1). A 2017 survey

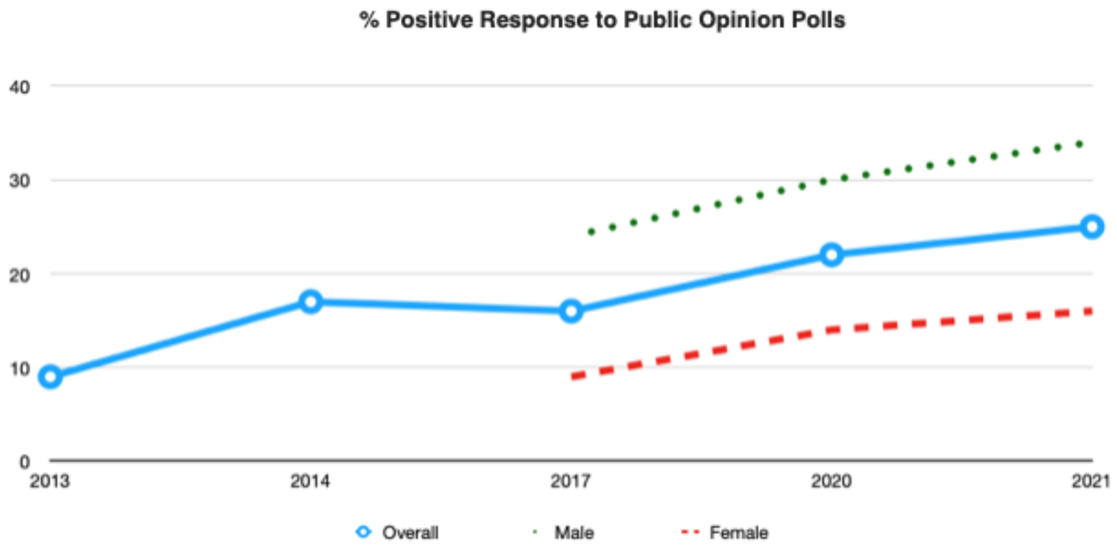

Fig. 1 Western countries show a positive trend in public opinion polls over time. Surveys included at least 1,000 participants, gender shown where data was available

See Appendix 1 for sources

conducted by YouGov found that nearly half (49%) of Americans expected sex with robots to be common practice within 50 years (Bame). In 2018, Business Leader reported more than 40% of UK men surveyed stated that they could imagine buying a sex robot for themselves within the next five years (Elijah, et al.). In 2021, a cybersecurity firm found that 25% of young people surveyed (ages 16-30) said they would strongly consider sleeping with a sex robot (Jiang). In less than a decade, this figure has more than doubled. In 2013, less than 10% of American adults gave the same response (Fig. 1).

More recently, in the context of the 2020 global pandemic, which left many quarantined and isolated, interest in private sex technologies has risen across the United States and Europe (Lee; Matozzo). The market for sex robots and sex dolls in particular has seen a significant increase in sales (Christian, 2020a). “I think that this event, as horrible as it is, will make the idea of synthetic companionship more appealing and acceptable to more people," said Matt McMullen, of Abyss Creations, who reported a rise of sales in both their RealDolls and Realbotix products (Owsianik, 2021).

Even without direct purchase or ownership, interest in sex robots is sincere. Catering to this interest some companies have found pathways to circumvent prostitution laws, by opening sex doll and sex robot brothels. Brothels allow men, women, and couples to experience sex with a robot or doll, without having to fork over the thousands of pounds, dollars, or euros.

“Sex-robot brothels” have allegedly been opening in major cities across Western countries like Spain, France, the United Kingdom, Russia, and Italy, beginning in Barcelona in 2017 (Rodriguez). It should be noted that not all brothels reported to feature sex robots actually do, and are instead staffed with sex dolls, which are often confused for their animatronic counterparts (see Table 1). In 2019, Sergi Prieto, owner of the Lumidolls, an international chain of reported ‘sex robot brothels’, stated, "For the moment, in Lumidolls, we continue to use sex dolls without additional functionalities.... In the market, there are some advances as well as sex dolls with facial movements and artificial intelligence. But at the moment, we do not contemplate introducing them into our brothels due to their high price and their low realism..." (Hicks). In other words, none of the Lumidolls brothels currently feature sex robots, despite what has been reported in the media.

2.1.2 Asian Markets

China is estimated to make more than 80 percent of the world's sex toys, with over a million people employed in the sex toy manufacturing sector (AFP, 2018). Similar to Western markets, Chinese sex toy companies also experienced a boom in sales during COVID-19 quarantine protocols, exporting record numbers of sex dolls and other products globally (AFP, 2020). China also represents an enormous part of the consumer market for sex toys, driven mainly by women and millennials (PRNewswire). The domestic Chinese market for sex robots and dolls is also thriving. This is often attributed to the deficit in women, a consequence of the country’s infamous

One Child Policy[3] (Fong). At least one Chinese sex robot manufacturer publicly acknowledges this connection. In 2018, Wu Xing Liang, marketing director at EXDOLL, told the AFP, "China has a shortage of women, and this is a factor in why there's this demand" (AFP, 2018). While there hasn't been any reports of sex robot or sex doll brothels opening in China - this type of information is usually suppressed (Chow) - there was at one point, an app-based doll sharing service, that was ultimately shut down (McKay).

Japan is another Asian market predicted to have large demand for sex robots in the coming years (SBS Dateline). Despite a shrinking population (due to a steady decline in marriage and birthrates), Japan's sex tech industry is booming (Michael). Local shops devoted to highly customizable sex dolls find no shortage of customers. In a 2017 interview for an Australian news television show, one doll shop owner told the program host that "with customers achieving companionship and intimacy with dolls like this, the next logical step is a talking, moving, responsive sex robot" (SBS Dateline).

It should be noted that there are some accusing the sex tech industry of exacerbating Japan's demographic issues, rather than being a symptom of it (Michael). Japan’s demographic problems are well known. Too few babies born, in a country where people are living longer and longer. On top of this, close to half of Japan’s young people are virgins, a statistic that has been increasing over the past decade (University of Tokyo). While public opinion polls indicate that young people would *like* to get married, it does not seem to be the case (Ryall). The choice to not get married has been speculatively blamed on everything from plummeting economic prospects and rising female empowerment (Rich), to over-indulgence of digital media (Kelts).

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[3] The One Child Policy was a family planning policy designed to curb over population in China, that was in effect from 1979 to 2015. The policy mandated that each family could have one child or pay a fine for any further children. As a result, an overwhelming number of parents attempted to bear sons, which often involved abortions or infanticide to ensure a son that could carry on the family name, or other cultural preferences associated with the male gender. This has led to an estimated 30 million "surplus" of single males without romantic partners; resulting in new markets catering to this demographic imbalance, including dating & matchmaking services, sex dolls & robots, and more nefarious activities like sex trafficking.

Other Asian countries have seen a similar decline in marriage and birth rates. In South Korea, people are marrying less, and later in life (Raymo & Park). In 2021, Taiwan's fertility rate dropped to the lowest worldwide, according to the CIA's World Fact Book statistical database (CIA). The other bottom five nations on this list are also in Asia (Kyodo News). Even China, one of the world's largest economies, has seen marriages declining by millions each year, while divorces rise (Ren et al.). However, while people in Asian countries are turning away from marriage, they *are* leaning into robots.

In a study commissioned by the European Parliament's Legal Affairs Committee, to evaluate the Civil Law Rules on Robotics, an interesting finding was made regarding the "Western fear of the robot". The study describes what they called a "common cultural heritage which feeds the Western collective conscience" that fears the "smart robot" that will one day automate everyone's work and take away man's power, culminating in an existential threat where humanity loses control of what it has created (Nevejans, 10) . They argue that this negative reaction towards robots has hampered the development and true potential of Western robotics industries. This fear of the robots is absent in Asian cultures, the report remarks, citing a variety of reasons like the post-WWII launch of Astro Boy as a beloved character, the Asian work ethic, and spiritual belief systems like Shinto (ibid.). From this report's view, Asian attitudes have created an atmosphere where robots fit in naturally with their society. World-renowned robotics professor, Hiroshi Ishiguro, also credits the Shinto belief system for why men in his native Japan are more willing to develop and embrace feelings for robots, and "simulated-versions of romance" (Cheok et al., 2017, 204; Mitaros). Putting this all together, sex robots are critiqued differently in the two hemispheres.

In the Western world, sex robots are a physical manifestation of female objectification and the imbalanced power structure between the sexes, whereas in Asian countries, sex robots are held up as both consequence and cause of growing demographic issues (Robertson, 28).

2.1.3 Other Markets

As of yet, there is no significant data to be found in published academic literature, nor news outlets, to indicate major sex robot markets opening in South America, Africa, or the Middle East. In South Africa, there has been some media buzz regarding the technology, and sex robots have become part of the national dialogue (Gee). While not domestically readily available, sex robots have been featured in national news pieces and radio shows (Nick; Qukula; Brooks). We do know from a 2012 study on the subject, that under Islamic law, sex robots would not be permissible, and those who consort with them would face various degrees of punishment (Amuda & Tijani). From this, we can surmise that in countries practicing Shariah law, sex robots are likely to be forbidden. This is could also likely apply to Muslim-majority nations within the Middle East and South Asia.

2.2 Sex Robot Prostitution and Law

Sex robots might have remained a novelty in the public mind, had it not been for the slew of “sex robot brothels” opening across Europe in 2017. These openings democratized access for those who could not afford a sex robot, or those who were simply curious, and wouldn't have otherwise invested in a purchase. By moving into their neighborhoods, these brothels forced communities to face their feelings regarding such technology. Earlier, I mentioned that not all of these brothels actually featured sex robots. However, for the purposes of this discussion, because they were portrayed in the media as “sex robot brothels”, using headlines like those gathered in Table 1, to some degree, this technicality hardly matters. Since they were portrayed in the media as such, we can effectively measure the social response to sex robots, robot prostitution and sex

Table 1. Misreported "Sex Robot" Headlines in the United States and Europe

Headline	News Outlet
Irish brothel renting out "realistic" sex robot attracts hundreds of new customers"	*Irish Mirror* 29 Aug. 2017
Russia's first sex robot brothel opens hoping to attract England World Cup fans this summer	*Mirror* 10 May 2018
Everything You Should Know About The Proposed Sex Robot Brothel in Houston	*Texas Monthly* 3 Oct. 2018
Sex robot brothel going global to open THIRD venue as firm says cyborgs will 'be the norm'	*Daily Star* 4 Jul. 2018
Sex robot brothel launched in Japan 'amid surge in men seeking bisexual threesomes	*The Sun* 27 Apr. 2019

robot brothels. What transpired, in nearly every case, was local outrage, press coverage, and debate (The Local FR). For nearly any news piece one can find about a brothel opening, another can be found about how that brothel was initially protested, eventually shut down, or both. The headlines gathered in Table 1 all reference "sex robot brothels" that actually employed non-animatronic sex dolls. Several of these brothels were Lumidolls locations, whose owner is on record saying he chooses not to use sex robots at his establishments.

This surge in robot-ready brothels had many communities re-examining social mores and limits of prostitution laws. In 2018, the Kinkysdolls brothel chain from Toronto tried expanding into the United States. Their first attempt in Houston, Texas was met by a 7,000-signature petition enacted by Elijah Rising (an anti-sex trafficking non-profit organization), and direct action from the mayor of Houston. This public resistance culminated in a unanimous vote from city council to change the ordinance that had allowed the brothel to operate within city limits (Tallet; Comella). In Paris, the City of Light's first sex doll brothel was protested by a coalition of feminist groups, 'communist-party councillors' and community members alike (BBCNews, 2018a; Katz). Perhaps no instance is more notorious than the Lumidolls brothel in Spain going head-to-head against a local sex workers union. The trade group, Aprosex, or Association of Professional Sex Workers repeatedly went to the city council declaring that the brothel's presence within a high-traffic tourist district of Barcelona was stealing their clientele and threatening their worker's livelihoods (Congostrina). The brothel was eventually moved from Las Ramblas to a rural, undisclosed location, where it continues to operate today, featuring sex dolls alongside human sex workers. Lumidolls charges the same rates for both women and dolls (€80 per ½ hour, €100 full hour), and reports that the dolls have their own regular clientele (VICE). The current rate of similar sex doll and robot brothels is roughly $150USD per hour, with half hour rates between $60-$80USD (Hicks).

As sex robot brothels continue to spread into Asia, we can likely expect similar local backlash. This has been evidenced by the response to Asian doll brothels in the past. In the early 2000s, the rapid expansion of doll "experience rooms" across Seoul quickly had South Korean citizens and police debating whether the dolls were in violation of the recently launched Special Law on Prostitution (Levy, 2011, 224).

2.2.1 Enacted Law

In 2016, the EU passed the Civil Law Rules on Robotics, which serves primarily as a code of conduct for robotics engineers and a preemptive way to address accountability for the purposes of liability and insurance. The legislation is vast in scope, covering all manner of robots from care robots to drones to autonomous vehicles, however no designations are made towards sex robots specifically. In the United States robots have appeared as subjects of various court rulings and legislation (see Calo, 2016). The first mention made to sex robots by name is the United States CREEPER Act regarding child-sized sex robots.

While sex robots in child form are not known to exist or be in production, in 2017, the United States Congress preemptively passed The Curbing Realistic Exploitative Electronic Pedophilic Robots (CREEPER) Act. This piece of legislation updated the 18th Amendment's Code on Importation and Transportation of Obscene Matters, to include prohibiting the importation or transportation of child sex dolls. The act also legally defined a child sex doll to be "anatomically-correct doll, mannequin, or robot, with the features of, or with features that resemble those of, a minor, intended for use in sexual acts.'' (U.S. Congress, 2017). In all, Congress had published 8 findings under this act, 7 of which made specific mention to robots, 3 of which were to do solely with robots (emphasized in bold):

The Congress finds as follows:

1. There is a correlation between possession of the obscene dolls, and robots, and possession of and participation in child pornography
2. **The physical features, and potentially the "personalities" of the robots are customizable or morphable and can resemble actual children.**
3. **Some owners and makers of the robots have made their children interact with the robots as if the robots are members of the family.**
4. **The robots can have settings that simulate rape.**
5. The dolls and robots not only lead to rape, but they make rape easier by teaching therapist about how to overcome resistance and subdue the victim.
6. For users and children exposed to their use, the dolls and robots normalize submissiveness and normalize sex between adults and minors.
7. As the Supreme Court has recognized, obscene material is often used as part of a method of seducing child victims.
8. The dolls and robots are intrinsically related to abuse of minors, and they cause the exploitation, objectification, abuse, and rape of minors.

-HR 4655, 115th Congress

In 2021, The CREEPER Act 2.0 was introduced to further tighten importation restrictions and redefine terms of the original 2017 version (U.S. Congress, 2021). Other Western nations have

Table 2. Legal rulings made on child sex dolls in Western nations

Location	Ruling
United Kingdom	In the 2017, an obscenity prohibition in the law regarding imported materials (1979 Customs and Excise Management Act) was ruled to apply to sex dolls, following a surge of imports that year of child sex dolls, mostly from Hong Kong and China (D'Arcy & Pugh). In March of 2019, the Crown Prosecution Service further defined parameters and offenses for publishing, possessing, or mailing a child sex doll (Lynn, M.).
Australia	Child sex dolls are designated as child abuse material under a 2019 amendment to Customs Act 1901, section 233BAB(5), and are classified as a Prohibited Tier 2 Good, making importation illegal and an arrestable offense, punishable by up to 10 years imprisonment and/or fines up to $555,000 ("Customs Act 1901"; Australian Border Force;)
Canada	During the 2019 trial of a man who was ultimately found not guilty, precedent was set when child sex dolls were found to meet child pornography and obscenity definitions (Geiger), under Canada Criminal Code 163.1, and thus unlawful under the federal Customs Act (Legislative Services Branch).
European Union	Laws against child pornography can be interpreted to cover child sex robots and dolls, specifically Article 2 of Directive 2011/93/EU on combating the sexual abuse and sexual exploitation of children and child pornography, regarding simulations of obscene materials depicting children (EU, 2011). In January of 2020 Danish Parliament committed themselves to a nationwide ban of child sex dolls, urging that the rest of the EU follow suit (European Parliament, 2020).

passed similar laws on the importation and possession of non-animatronic child sex dolls, which are likely to be extended to cover child sex robots (Maras & Shapiro). Table 2 gathers instances of court cases and legal rulings on child sex dolls in English-speaking countries.

2.2.2 Legal Rulings in Non-Western Nations

SexDollOfficial.com, an online aggregator of sex doll markets warns its customers that while sex dolls are legal in most countries, “child sex and pornography laws need to be carefully and seriously considered”, citing that India, Turkey and Brazil have strict laws on *any* sex dolls due to “the fact there are arguments made that some dolls that are smaller may actually represent children”. In addition, they state that restrictions in these countries, and others, will prohibit rental of sex dolls, as it replicates “brothel-like” transactions (sexdollofficial.com). Since all commercially available sex robots, to date, are made by sex doll manufacturers (Abyss Creations, EXDoll, and DSDolls/Ai-Ai Tech are all producers of sex dolls), it is more than likely that these same laws would also apply to sex robots.

2.3 The Campaign Against Sex Robots

For the past several years, the Campaign Against Sex Robots (CASR) has been working in the United Kingdom towards the goal of abolishing the production and sale of sex robots. Comprised of academics, researchers, and professionals of all backgrounds, CASR believes sex robot technology contributes to gender inequalities and endangers women and children. Their website features policy documents urging for legislation on a complete European ban of sex robot technology, insisting that regulation will simply not be enough to stop what they believe to be an “ethically problematic development in society” (Richardson, 2018). CASR's founder, Kathleen Richardson has also published a position paper, drawing close parallels between the development of sex robots and the sex work industry, arguing that both reduce the female body to a commercial non-human object (Richardson, 2016). Richardson reminds readers that the suggestion that sex robots could somehow reduce demand for prostitution or decrease human trafficking is not borne out of any practical evidence (ibid.). It is also worth noting that many of the US Congressional findings on child sex robots that went into the CREEPER Act, seem to be directly influenced by CASR's policy research, and borrows much of the same language.

In 2019, CASR was joined by several Swedish feminist groups when Sweden's Women's Lobby, the National Organisation for Women's Shelters and Young Women's Shelters [sic] filed a joint appeal against sex robot technology in the Swedish newspaper *Expressen* (Vincent). The appeal argued that by replicating lifelike women, the technology justifies slavery while dehumanizing women. The coalition's action steps called for an inquiry to address how technologies that normalize abuse can be restricted as well as a plan to incorporate topics like dangerous sexual power dynamics and sex dolls & robots into the country's child sexual education programs (ibid.).

Other arguments against sex robots accuse them of inciting the following behaviors in users:

- Lowering inhibition thresholds
- Increasing sexually deviant behavior
- Reducing empathy
- Dehumanization
- Increasing loneliness & isolation
- Promoting predatory behavior
- Abandoning human relationships
- Mistaking distress for excitement
- Perpetuate rape fantasies

2.4 Human Robot Interaction

Robots have long presented ethical concerns that challenge our ideas of intimacy and humanity. The burgeoning field of Human Robot Interaction, or HRI, explores whether humans can develop empathy for robots, or stronger emotional bonds. The scope of HRI covers everything from how people treat their Roombas, to how robots could be programmed to experience love. The recent graduation of sex robots from the realm of science fiction fantasy to consumer reality has infused the field of HRI with new areas of research and topics of discussion (Gonzalez-Gozalez et al.).

The International Congress of Love and Sex with Robots is an annual gathering for scientists, philosophers, and like minds to explore various categories regarding mechanical sex with robots, scientific progress in teledildonics, and actual intimacy between humans and robots. However, not everyone is as open-minded. The Congress has faced its fair share of controversy and has struggled to meet in years past, due to local protest in host cities, police involvement in Malaysia, and even death threats in London (Christian, 2019; Owsianik, 2015).

The conference's founder, Dr. David Levy has written extensively on human-robot intimacy and relationships, long before sex robots became commercially available, or robot sex was feasible. In 2007, his doctoral dissertation was adapted into a book, "Love and sex with robots:

The evolution of human-robot relationships" and is considered a seminal work on the subject. His paper, "Robot Prostitutes as Alternatives to Human Sex Workers", is another early influential publication in sex robot discourse, and outlines the author's perceived benefits of robot prostitutes when compared to their human counterparts. Here, Levy puts forth that robot prostitutes would have significant social and psychological benefits to offer society while being ethically less problematic than their human counterparts (Levy, 2007). A decade and a half later, sex robot prostitutes have appeared. One study conducted in Finland appears to support some of Levy's initial predictions. Researchers have found that on average people do seem to find engaging in sex acts with a robot prostitute over a human sex worker to be the less morally problematic choice (Koverola, et al.,).

In 2010, the conference's former co-chair Adam Cheok, co-authored *Probability of Love Between Robots and Humans*, a framework for establishing sentimental connections between humans and robots and a mathematical model for identifying factors of love and interpreting artificial intimacy, called 'Lovotics' (Samani & Cheok). Cheok would return to further developing the Lovotics concept numerous times in the years to follow. In 2017, authors across many disciplines would come together and share perspectives on sex with robots (including considerations on the robot's own perspective) in *Robot Sex: Social and Ethical Implications*, through MIT Press (Danaher & McArthur, 2017). The literature is robust and dynamic. Contributions to the topic of Human Robot Interaction following the introduction of sex robots has been wide-ranging, advancing from widely divergent fields of study (Döring, et al., 2020).

At the global forefront of robot production, and companion-care technology, it should come as no surprise that Japan is a leader of HRI study. The nation is home to the world-famous Intelligent Robotics Laboratory at Osaka University, headed by Professor Hiroshi Ishiguro. Prof.

Ishiguro is notorious for making an android replicant of himself, amongst other creations, and speaks at international HRI conferences regularly. In fact, Ishiguro often sends his android replicant ahead of himself to conferences and lecture halls all over the world, to give talks in his stead. When asked about the obvious fact that as the professor ages, his robot counterpart will remain the visual same, Ishiguro is quick to concede- but rather than taking it as a defeat, he has turned it into an opportunity:

> Interviewer: Naturally, as a human you are going to get older, and the robot is going to stay the same. Are you concerned about that?
> Ishiguro: Very much, because always people compare my android and myself. Therefore, I am running another project to make my face similar to the android. It's a kind of plastic surgery project. It's a collaboration. Not such a heavy one. It's just injections and laser treatment. I'm making my face younger and adapting to the android.
> The boundary between human and robot is going to disappear soon. We cannot separate humans and robots, right? We are the same.
>
> -*SBS Dateline*, air date: April 11, 2017

2.4.1 Sexual Identity, Robots, and Technology

In terms of sexual identity, *robosexual, digisexual*, and *technofetishism* are all terms that have been used for decades to describe sexual alignments, orientations, and identities. Robosexual is used to describe people who are sexually attracted and feel deep emotional attachment to robots. Robosexuals will form strong uni-directional relationships with robots, often filled with strong feelings of commitment and romance[4]. Robosexuality is listed as one of many Marginalized Gender Orientations, and even has its own pride flag (Fig. 3), with the differently sized bands and color shades representing various facets of the identity expression (MOGAI Encyclopedia). Digisexuality, also referred to as Technosexuality, is a primary sexual identity that is facilitated

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[4] See Table 3. Instances of Human-Robot Marriages

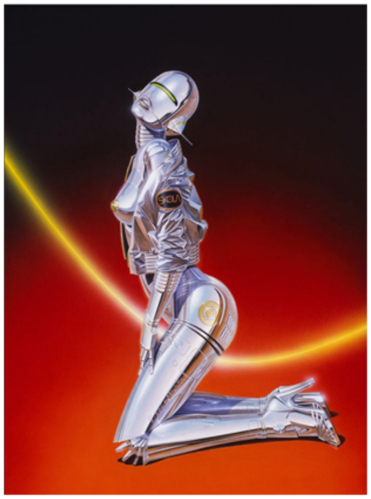

Fig. 2

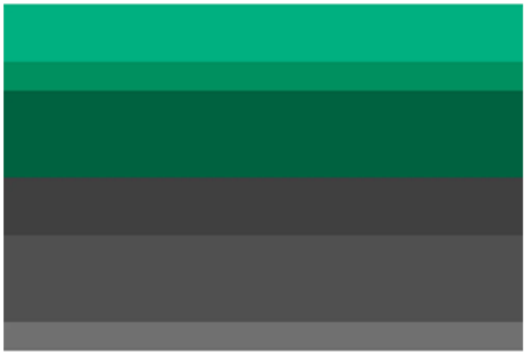

Fig. 3

Above: Robosexual Pride Flag
Left: ***Untitled*,** Hajime Sorayama

by technology. MacArthur & Twist describe how sex robots and VR technology fall into the second wave of digisexual identity; the first wave having to do with access to technologies like digital pornography, webcams, and teledildonic devices. Sex robots and VR are differentiated because they "promise a sexual experience that is qualitatively different from that offered by first wave technologies" (McArthur & Twist, 2017, 336). Technofetishism is a variation, where its members fetishize the incorporation of technology and the body, be it human, android, or cyborg[5]. This blending of the body and technology borrows heavily from cyberpunk and science fiction motifs, and technofetishists place a fixation on how bodies can be enhanced (deFren). In this way, it differs from the one-way objectophilic nature of Robosexuality. However, these terms are not mutually exclusive; for example, any of these terms can be applied when describing the artwork of Japanese artist Hajime Sorayama, famous for his chrome-polished pin-ups (See Fig. 2).

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[5] *Cyborg*, short-hand for 'cybernetic organism', refers to technologically mediated biological bodies. The term is not exclusive to humans; cyborg dogs, cyborg birds, even cyborg dinosaurs have all appeared in science-fiction media.

2.5 Security and Sex Technology

Security is a factor with both tremendous uncertainty and potential for impact, as such, it was important to include the following summary in this literature review. Currently, the sex industry faces many challenges when it comes to security and introducing new technology. This section explains those challenges and provides context for sex robot production and cyber security.

2.5.1 Teledildonics & IoT: A Lack of Industry Standards

Even without the risk of STDs, society will still need to use digital protection when having sex with robots and other sex technology devices in the future. Teledildonics, a term coined in 2004, represents Wi-Fi, Bluetooth, and otherwise network-connected sex devices, toys and equipment (Lynn, R.). Teledildonic devices have a wide range of applications serving long-distance partners or individual users. The field recently exploded when the 20-year patent on network-connected sex devices expired in 2018 (Cole, S.).

Since then, there has been a deluge of new products- products that allow remote partner interaction, collect biofeedback information, and establish webcam connections with all manner of sex devices. With these new products, and new points of connection, come new vulnerabilities, exploits, and attacks (Morse; Giusto & Pastorino). Teledildonic devices, and by extension sex robots, as network-connected devices, are considered part of the Internet of Things, or IoT. IoT refers to network connected devices with sensors and software designed to communicate with each other through various short-range technologies (Stoltzfus). IoT devices can include wearables, appliances, standard electronics, and "smart" app-paired objects.

Amie Stepanovich, a privacy expert and US policy manager at nonprofit advocacy group Access Now, explains one of the major problems befalling the sex industry when it comes to connecting sex toys to the internet. “These devices, like other IoT devices, are being produced by companies that have never connected products to the internet before," says Stepanovich (Dreyfuss). Sex toy companies are also left to police themselves when it comes to security management. A recent survey found that some companies operate with complete disregard for security, while others collect data on their customers without user consent or knowledge (Mozilla). This has resulted in several FTC investigations and multi-million-dollar lawsuits against sex tech companies in the United States (Martin; Doyle).

All IoT or smart devices are vulnerable to myriad malware attacks, including illicit spyware, denial of service, and ransomware. However, sex devices, by their intimate and personal nature, are open to a new range of attacks- that some have gone so far as to call rape (Sparrow & Karas), or at the very least, sexual assault (Lampen). Sex device-specific attacks are so prevalent, they have birthed their own terminology. The following are just two examples, that could befall users of sex devices with poor security designs:

> *Screwdriving* allows a hacker to discover and access BLE (Bluetooth Low Energy) signals emitted by sex toys. As of now, BLE is the industry standard for pairing IoT devices to other systems and is already known to have very poor security (Ryan). Once the screwdriving is a success, the hacker can interact with the user's device without their consent, and potentially access other devices connected to the same network, such as their smartphone and laptop (See: Lomas, 2017).
>
> *Sextortion* is the term given to blackmail and coercion accomplished through using sexually compromising photos, video, and other recorded media, of the victim. This type of material is sometimes referred to as 'revenge porn', when used for the purposes of humiliation rather than financial gain. This type of data can be retrieved via sex devices, though not exclusively. Smart phones, cameras, and cloud-based data storage services are

sources commonly mined for sextortion material. In addition, text-based information gleaned from emails, chat dialogues or adult website profiles can also be used (Hinduja).

A common cyberattack on IoT devices are ransomware attacks. Since many IoT devices have critical security flaws, like weak or non-existent passwords, they are often easy targets. Using ransomware, a hacker gains control of a networked device, and can hold functional use of the device hostage until the victim pays a ransom, usually via an untraceable crypto currency (Chadd). IoT devices are a popular target for such attacks, and sex devices are no exception. In a famous recent example, an app-connected chastity belt for men with a known major security flaw was hacked, causing user's devices to lock and display taunting messages from the hacker (Ilascu).

New sex technologies are likely to be combined, and a small vulnerability on either end could bring the house of cards crashing down. Kiiroo is a VR haptic[6] sex toy company that makes products which allow long-distance couples to connect for a sexual experience, or solo users to enter a VR world that pairs to their sex toys (kiiroo.com). In 2019, Nevada brothel Alien Cathouse reportedly purchased a sex robot to integrate with a Kiiroo kit, with hopes of allowing clients from around the world to use the brothel's services (Moran). Such a venture, to be completely secure, requires security checkpoints at every step; from Kiroo's product platform to the brothel's network, to the access point of the remote customer.

In their 2021 cybersecurity industry white paper, "Sex in the Digital Era: How Secure are Smart Sex Toys?", Denise Giusto and Cecilia Pastorino warn, "with sex toys, the sensitivity of the information processed is extremely critical: Names, sexual or gender orientation, lists of sexual partners, information about device usage, intimate photos and videos—all these pieces of information can have disastrous consequences if they fall into the wrong hands " (Giusto &

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[6] Haptic technologies, also known as kinaesthetic communications, are those that employ a sensory feedback system to recreate the sensation of touch, by applying force, vibration, or motion (Critchley).

Pastorino). With new teledildonic sex technologies like sex robots, and the VR haptics mentioned above, not only is private information vulnerable to attack, but the sex act itself (Sparrow & Karas).

2.6 Exploring Possibilities

The literature review thus far has reflected the world in which sex robots fit into. The next part will examine the discourse on where they might go in the future.

In 2017, the Foundation for Responsible Robotics (FRR) released their comprehensive survey "Our Sexual Future with Robots: A Foundation for Responsible Robotics Consultation Report" (Sharkey, et al). Published on the heels of many first-generation sex robots being brought to market, it was the first and most comprehensive survey of its kind. In it, the authors explore many futures regarding sex robots by posing seven research questions that are answered through extensive surveys and interviews.

> Q1. Would people have sex with a robot?
> Q2. What kind of relationship could we have with a sex robot?
> Q3. Will robot sex workers and bordellos be acceptable?
> Q4. Will sex robots change societal perceptions of gender?
> Q5. Could intimacy with robots lead to greater social isolation?
> Q6. Could robots help with sexual healing and therapy?
> Q7. Would sex robots help to reduce sex crimes?
>
> -FRR*, Our Sexual Future with Robots,* 2017.

The last two questions: Q6. *Could robots help with sexual healing and therapy?* and Q7. *Could sex robots help to reduce sex crimes?* were the first time the therapeutic value of sex robots was given serious consideration. The results suggested that sex robots could potentially be used to treat a variety of sexual dysfunctions, from physical issues to emotional blockages.

Since then, there has been an eruption of academic exploration into how sex robots could be used in a therapeutic environment (Döring, et al., 2020). Sex robot manufacturers likely see this as a natural progression. Roxxxy, considered to be the very first sex robot, is said to be originally modeled after a caregiver robot (Plafke). Matt McMullen, head of US sex robot manufacturer Abyss Creations, has said that their product is "so much more than a sex robot... it's really more about companionship and I feel really strongly that some of the fundamental technologies that we are working with could be used for the benefit of a lot of people -in care facilities, even virtual secretaries- it can go well beyond the sexual aspect." (Cole, B.)

What follows is an appraisal of suggested therapies in publication. In any of these cases and usages, an argument is not to be made in their favor here. It is merely a presentation of what exists in the literature. However, arguments that point out significant risks, and reflect public discourse, are included when appropriate.

2.6.1 Elderly & Disabled

Elderly segments of the population undoubtedly continue to experience sexual desire into their later years (DeLameter & Sill). However, age-related changes cause a significant portion of this demographic to experience sexual dysfunction (Trawka, et al.). Disabled people too, experience their own sexual issues and can have difficulty achieving sexual gratification on their own, or without assistance (DiNucci, 2017). Unfortunately, in addition to experiencing physical difficulties, both groups tend to be marginalized when it comes to being provided with quality information and access to resources, or even simple acknowledgement as sexual beings (Jecker 27-28; Fosch-Villaronga & Poulsen, 2020, 3-4) With the right support, elderly and disabled people can create their own sexual experiences and take active control of their sex lives in a way that meets their needs. There is research to suggest that sex robots could provide this support, with or without the assistance of another person (Fosch-Villaronga & Poulsen, 2020; 2021). Bioethics professor Dr. Nancy Jecker argues that not only is it in society's best interest to provide the elderly with access to sex robot technology, it is also necessary to supporting and respecting their human dignity (Jecker, 28).

Research has shown that people with conditions that impair their sexual functioning -breast cancer patients, sexually active seniors, chronic pain sufferers etc.- already find sex devices and similar products to be helpful (Döring & Pösch, 2018). Authors Eduard Fosch-Villaronga and Adam Poulsen do an excellent job of exploring this further with sex robots, going so far as pairing existing robot models to the conditions they are best suited to address. For example, models that provide simple rocking movements or genital massage do not require much effort expenditure from the more fragile user; the ‘intrinsic patience’ of models with language-building skills could prove invaluable to the mentally impaired while helping to improve social functioning over time (Fosch-Villaronga & Poulsen, 2020, 11).

Fosch-Villaronga & Poulsen also outline existing ‘sex care’ programs in Europe where sex robot technology might compliment or replace human sex care workers. These programs usually employ compassionate sex workers, that provide voluntary services to disabled clients in need of assistance (ibid., 4-5). In "Sex Robots and the Rights of the Disabled", ethicist Ezio Di Nucci demonstrates how using sex robots to replace human sex workers in this type of care work is preferable, by asserting that it doesn't violate anyone's negative sexual rights- that is, the care worker's right to *not* have intercourse isn't sacrificed for the receiver's positive sexual rights to pursue satisfaction. In addition, Di Nucci points out, some human care providers can harbor the capacity to be abusive, whereas sex robots could be programmed to eliminate such forms of behavior (DiNucci, 2017).

2.6.2 Trauma Therapy & Other sexual Dysfunctions

One of the critical objections to sex robots is that they will breed more perpetrators of sexual violence by encouraging misogynist attitudes about women and children's bodies (Richardson, 2018). However, others speculate that rather than creating victims of sexual violence, sex robots could be used to treat existing ones. Preliminary investigations into sex dolls indicate that sex robots could help with certain types of affective disorders. Case studies have shown that living with sex dolls has allowed some men to overcome various trauma, build confidence, re-engage with society, and pursue new real-world relationships (Knafo).

Therapists seem to be open to the inclusion of sex robots in their practice. In 2018, researchers at Sigmund Freud PrivatUniversität surveyed a group of medical professionals and therapists on their attitudes towards potentially incorporating sex robots in various types of therapy (Eichenberg, et al.). Their findings showed that the majority of sex therapists surveyed believed that sex robots *could* have therapeutic potential, with some caveats. Most agreed that sex robot therapy is worth exploring to treat certain conditions, but such treatment options should always be considered on a case-by-case basis, and not viewed as an immediate alternative for any affliction. The following is a list of conditions where sex robots could potentially help with treatment:

- Gender Identity Disorders
- Erectile dysfunction
- Orgasmic disorders
- Genital mutilation victims
- Spinal cord injuries
- PTSD survivors/veterans
- Paraphilias
- Sexual Aversion / Social Isolation
- Sex Addiction
- Mismatched partner libido
- Exploring sexual orientation
- Exploring sexual boundaries

At the top of the list for conditions that could benefit from sex robot therapies, were patients with orgasmic disorders, social anxiety disorders, or those lacking partners (ibid., 9). Survey participants were most receptive towards using sex robots to help treat physical dysfunctions and emotional blockages, for example, erectile dysfunction, premature ejaculation, and anxiety about sex (ibid., 9-13). The therapists in the study also discussed how sex robots could be beneficial to different genders in distinct ways. For example, for women who have been the victims of rape or other sexual trauma, experience with a robot partner could help with issues regarding physical penetration without the added emotional investment of seeking out, trusting, and practicing with partners (ibid., 12). Other authors have also pointed out that the passive and perpetually compliant nature which sex robots are often criticized for having, can actually translate to an ideal quality for those in sexual trauma recovery. In an opinion piece for the Guardian, authors McArthur and Danaher write,

> [F]or a survivor of sexual trauma, a partner who is entirely unthreatening and who always follows your lead may not seem like such a horrible prospect. Sexbots may prove to be an important therapeutic tool in helping trauma survivors heal, and to transition back into relationships with human partners (McArthur & Danaher, 2017b).

2.6.3 Rehabilitative Therapy

Due to the nature of the topic, the use of sex robots to treat sex offenders is a highly contentious suggestion. Again, rather than incite sexually abusive behavior, there are some hoping sex robots could instead rehabilitate certain types of sex offenders (Dean). While this proposal has been made often, even the most preliminary framework for implementation is currently lacking (Cox-George & Bewley, 162).

There are some promising indications that prolonged exposure to sex robots may help modify abusive behaviors, when looking at existing studies on sex dolls. Researchers have noted that rather than promoting aggressive behavior, sex doll ownership often inspires affectionate performances with care-taking activities (Burr-Miller & Aoki; Knafo). Even users who purchased dolls primarily for sex, rather than companionship, quickly find themselves enjoying delicate maintenance rituals such as hair brushing, nail painting, and applying makeup (The Sex Robots Are

Coming). While this does not speak to correcting sexually violent behavior directly, ownership and prolonged exposure to sex robots could increase empathy-building behavior (Knafo). Döring points out that research has shown one-way relationships (like celebrity crushes and sex dolls) can be helpful in dealing with developmental tasks and challenges. She writes "experiencing lust and love with a human-like artifact can provide a safe space for helpful and healing experiences that ultimately foster better interpersonal relationships" (Döring, 2021). Critics of sex robots argue the exact opposite, firmly insisting that sex robots do not improve one's empathy, and if anything, diminish one's capacity for it (Richardson, 2018).

One type of sexual predation, that is often invoked when it comes to sex robots, especially in the media, is pedophilia. Without diving into cognitive behavior theory and the motivations of pedophiles, I will first briefly discuss the use of child sex dolls to correct pedophile behaviors, and then, the child sex robot.

As Jon Brown, head of the United Kingdom National Society for the Prevention of Cruelty to Children (NSPCC) points out, "There is no evidence to support the idea that the use of so-called child sex dolls helps prevent potential abusers from committing contact offenses against children" (D'arcy & Pugh). Regardless, they are being used to this end. Psychosexual specialist Julia Grayson, founder of UK-based S.T.O.P. SO (Specialist Treatment Organization for the Prevention of Sexual Offending), believes prescription of child sex dolls *could* potentially curb assaults against real world victims (Revesz). While Dr. Grayson does not incorporate them into her practice, she does have at least one client who uses child-sized sex dolls in this manner (Grayson). She works regularly with these types of offenders and has conducted research indicating 5% of the male population have a predilection towards prepubescent children at some point (Fitzgerald). Grayson and others have equated these dolls with methadone treatment for a heroin user (Revesz). Makers of child sex dolls, believe the same. Shin Takagi is the founder of Trottla, one of the very few companies that explicitly produces sex dolls resembling children. Takagi is also a self-professed 'non-offending pedophile' and sees his company's product as harm-reduction. "We should accept that there is no way to change someone's fetishes... I am helping people express their desires, legally and ethically" he told The Atlantic in 2016 (Morin).

As for child sex *robots*, the question becomes, does adding robotic functionality to the child sex doll offer any possible value to treatment? To answer this, I will turn to "Child Sex Dolls and Robots: More than just an uncanny valley" from the *Journal of Internet Law* by Dr. Marie-Helen Maras and Dr. Lauren Shapiro. While there have been other substantial contributions on the topic (See Danaher, 2019b), it is a succinct work that successfully and patiently draws upon often-times uncomfortable facts to investigate whether child sex robots and dolls could be used to positive ends. First, there is the problem of reinforcement. Both doll and robot allow the pedophile to rehearse the unwanted behavior and reinforce it with orgasm. Secondly, there is no value to adding vocalization or animatronics to the child sex doll that will enhance the likelihood of not offending. Positive vocalizations would communicate that the act is enjoyable to the victim, negative vocalizations cause the pedophile to associate their own pleasure with the victim's pain, and the silent, neutral doll without vocalization fails to provide the emotional feedback and distress needed to communicate that the victim does not want to accept abuse (Maras and Shapiro, 9). In addition to ineffective audio communication, neither robot nor doll display the correct visual cues to communicate pain and wrongdoing. To be blunt, they do not bleed, they do not bruise or break bones, cry when its skin tears, or choke. Children, do. Lastly, in author’s words, "the fact they look like human children, combined with the primary purpose of their orifices being to accommodate an adult penis, are what makes child sex dolls and robots patently offensive." (ibid., 11).

Currently, there is no reason to believe, nor evidence to indicate that child sex robots have been produced, or made available for sale, at least not on the surface web. Regardless, the United States Congress has passed the aforementioned CREEPER Act, which makes pre-emptive assignments to child sex robots, and prohibits the import and distribution of child sex dolls and robots within the United States. As stated, many countries have passed laws and held court on whether life-sized child sex dolls constitute child pornography or obscene materials, and it would be a logical extension that such rulings would also apply to child sex robots, should they ever appear (Maras & Shapiro, 12-17).

2.6.4 Government & State-sponsored programs: Prisons and Military

Previously, any writing to be found in academically published literature that gave any considerations to the use of sex robots in prisons, was to be found in the form of a question in "The Attitudes of Therapists and Physicians on the Use of Sex Robots in Sexual Therapy" (Eichenberg, et al). This question asked therapists of the appropriateness of sex robot usage within isolated populations, listing prisons as an example (ibid, 8). In 2021, Oliver Bendel explored the idea of sex robots in prisons to some length, along with other isolated populations that could benefit from immediate availability of sexual release. Bendel suggests that sex robots could be a means of establishing sexual health within prisons, which is otherwise mostly forgotten, and work towards minimizing the sexual tensions that contribute to violence (Bendel, 2021, 7).

Bendel also discusses the possibilities of using robots to promote sexual health in the military. He places sex robots in future outposts and barracks, on overseas deployment, and in missions of war (ibid.). Bendel points out the benefits of sex robots in the military would extend past soldiers' momentary satisfaction. Citing examples from history, Bendel reminds readers that local prostitution often rises to meet the demands of men stationed abroad; when it cannot, rape, torture, and slavery soon often follow (ibid., 7). Bendel writes that every prison and every barrack would have their own dynamic when it comes to handling sex robots, and gives enough space to addressing responsibility, risks, and repercussions (ibid, 7-8).

2.7 Social Disruptions

Another alternative role, the literature suggests sex robots may play, is as a catalyst for mass change within our social institutions.

2.7.1 Marriage

Take marriage. Marriage rates all over the world are declining (DePaulo). This decline is often attributed to female empowerment, access to education, and freedom of choice (UNWomen). Many are hoping that this demographic shift, along with new technologies, will provide opportunities for social transformation in the years to come (Friedman). Some believe that sex robots will be one of these technologies that will go on to affect marriage in a whole new way. There are two paths from which to consider marriage and sex robots. Marriage *to* robots, and marriage *with* robots. The former, marriage between a human and a robot, is far less impactful on a social scale, and has already occurred, albeit infrequently (see Table 3).

In 2007 David Levy famously predicted that humans would be marrying robots by 2050 (Choi). Fifteen years later, already a handful of marriages have taken place. Thus far, with one exception, these marriages are between males and a female-gendered robot, or gynoid. In all these cases, as Gary Marchant, Regents Professor of Law, observes, "Robot-human marriage is not about robot rights; it is about the right of a human to choose to marry a robot" (Marchant). Table 3 gathers human to robot marriages that have been documented in news media.

Table 3. Instances of Human-Robot Marriage

Name / Alias	Country	Model	Year
Geoff Gallagher	Australia	Emma	2020
Zheng Jiajia	China	Self-made	2017
"Nelly"	France	Self-made	2016
"Zoltan"	USA	Self-made	2008

See Appendix 1 for Table sources

The work of Goldfeder & Razin, lays the groundwork for establishing threshold requirements necessary for more sophisticated robots to enter into marriage contracts. In "Robotic Marriage and the Law", the authors ascribe three criteria robots must meet to demonstrate intellectual capacity for marriage: comprehension, consent, and decision-making ability. This decision-making could come down to the robot entering into a marriage to serve its best interests, such as likelihood of insured maintenance, the same way a person might enter into a marriage that held the promise of financial security. They remind us that "whether or not [robots] can actually love is legally irrelevant. Many marriages are not premised on love, and love is certainly not a legal requirement for a marriage to be valid." (Goldfeder & Razin, 152-153) The authors contend that human to robot marriages ought to be considered valid so long as they can meet the standards of various marriage fraud tests applied to sham marriages in other aspects of law, such as immigration court, family law, and insurance determinations (ibid, 153).

Whether or not people go on to marry robots, author Marina Adshade believes that sex robots could still play a role in strengthening unions and decreasing the likelihood of divorce. In her contribution to *Robot Sex: Social and Ethical Implications*, Adshade reminds readers that "new technologies completely transformed sexual behavior over the second half of the twentieth century. We have decades of technology-induced social change to guide our predictions," citing advancements in birth control as a catalyst for the women's liberation movement, and other technological butterfly-effects (Adshade, 2017, 289). For Adshade, sex robots may too be a technology that could inspire a social paradigm shift. Rather than pervert marriage, Adshade puts forth that marriages which welcome sex robots could become longer lasting and more fulfilling. According to The Austin Institute for the Study of Family and Culture, infidelity is the highest leading cause of divorce in America (Austin Institute); a 2016 survey of sex therapists reveals incompatible desires and libido levels as the number one issue and underlying cause of half of couples seeking therapy (Wong). Sex robots could offer partners with mismatched libidos another avenue of sexual release, that stays within the bounds of the relationship. Adshade surmises that, by reducing the need to look outside the marriage and commit acts of adultery, sex robots could therefore drive down divorce rates (Adshade 2017; 2018).

There are already couples that have validated Adshade's vision. In 2020, a couple in Texas shared their story with the press, about how a sex robot saved their marriage (Bailey-Millado). Trapped in a failing polyamorous relationship, the robot allowed the couple to continue to have diverse sexual experiences without having to deal with the complicated emotional fall-out of introducing new partners into the mix. The robot, Camila, was purchased from Abyss Creations for this specific purpose. What they did not expect was the robot to act as a sounding board for their other issues. Camila's personality software has the capacity to simulate conversation, this allowed the couple to use her as a vehicle for negotiating their own feelings about the marriage, and then open up to each other.

> Husband: What Camila does for me is allow me to be a better husband to Shelly. I can be more involved in our marriage because I have Camila to confide in.

> Wife: He talks with Camila about how he feels about us, and once he has spoken to her and been able to understand how he feels, he brings it to me
>
> -*New York Post*, April 14, 2020 (Bailey-Millado)

Arran Squire, credited as a co-creator of sex robot Samantha from Synthea Amatus, shared on UK television show *This Morning*, how he has incorporated an AI-enabled robot into his marriage and family. Not only has his wife welcomed Samantha into their bedroom, Squire's children are fans of Samantha as well. In 'family-mode', Samantha regularly interacts with Squire's minor children, teaching them about animals, and telling jokes (This Morning).

Adshade predicts that widespread adoption of sex robot technology could also encourage new types of couple pairings (Adshade, 2017, 294). For example, two women of different sexual orientations could live together happily and raise a child together, each with their own robots built to match their sexual preferences. In their exploration on therapeutic potentials for sex robots, Fosch-Villaronga & Poulsen describe the following hypothetical: "Rocky, the sex robot, could help a closeted elderly gay man who lived his life in a lavender marriage and never pursued gay relationships or sexual relations...using Rocky could allow that person to make up for lost time, both sexually and emotionally without fear." (Fosch-Villaronga & Poulsen, 2020, 11).

With sexual intimacy and marriage disentangled, Adshade predicts a "new form of marriage [that] would be a socially optimal arrangement in the sense that it would encourage efficient household formation and, as a result, lead to marriages that stand the test of time" (Adshade, 2018). Furthermore, this change will affect the institution of marriage by normalizing non-exclusive relationships as the dominant relationship structure, challenging legal institutions to adapt accordingly. Over time, this new paradigm could give married couples the space to negotiate their comfort levels with seeking gratification with non-robotic partners as well (ibid.).

However, this could all be a long shot. After all, a robot costs a lot more than a condom, and widespread adoption of the technology, through access and affordability, will be essential for this social transformation to happen (ibid.). To this end, Adshade admits that lower socio-economic groups unable to afford the technology would be excluded from such a future, and likely retain older social practices (Adshade, 2017, 297). In "The False Promise of Universal Basic Income", Alyssa Battistoni writes, "the kind of starkly unequal society that… futurists fear wouldn't just come about because the robots arrived- it would come about because only a few people owned them" (Battistoni). Though Battistoni is referring to robots as representations of the means of production, it is still apt alongside Adshade's point on lower economic groups becoming marginalized. If robots, and sex robots, have the capacity to be a socially liberative technology, then, like birth control, like the internet, any hope for transformation hinges on access.

2.7.2 Economics and the Sex Work Industry

In 2014, author John Danaher used sex robots and prostitution to frame a conversation on Universal Basic Income. In "Sex Work, Technological Unemployment and the Basic Income Guarantee", Danaher argues that whether sex robots displace prostitutes, or technological unemployment drives more people into sex work, the case can be made for an income guarantee. He outlines two possible futures for sex robots and human prostitutes. In both futures, mass unemployment has flushed people from the tech field into lower wage jobs, including sex work. In the first scenario, human prostitution is replaced by sex robots due to their many advantages, the same way automation has replaced factory workers. In the second future, human sex workers are still valuable and rely on their own "erotic capital", as other forms of human labor are made redundant by technology. He argues that whether human sex workers are displaced by sex robots, or remain resilient, that the Universal Basic Income is necessary in either condition because it A) provides safeguard for sex workers in financial insecurity or B) dissuades people from entering into sex work. While sex robots do not necessarily induce social change, they are certainly a direct factor in Danaher's futures (Danaher, 2014).

Speculation into how sex robots will affect the sex work industry has long persisted in both academic writing and public discourse (Levy, 2007, 2011; Richardson, 2016). In 2012, Yeoman and Mars predicted that by 2050 sex robots would completely upheave the sex tourism industry. The authors imagine a future where sex robots have replaced the human sex workers, prostitutes, and escorts of Amsterdam's famous red-light district. In this way, the sex robots have eliminated many of the unwanted by-products and dangers of sex tourism, from the risk of STIs to human trafficking (Yeoman & Mars).

For the time being, sex workers don’t seem to be worried about being displaced, nor threatened by synthetic competition. In a talk on The Ethics of Sex Robots with the IAI (Institute of Arts and Ideas), former escort Brooke Magnanti, was quick to dismiss forecasts declaring that sex robots will replace the sex work industry, end prostitution, and eliminate human sex trafficking. "If it was just the act of getting somebody to reach orgasm that constituted what sex work is, and what sex is, I would not be that effective as an escort,” relates Magnanti (IAI. She goes on to explain that clients, in her view, come for the sex, but return for the pillow talk and human interaction. She cements this by pointing out, “When you look on review boards for escorts, the most cutting thing that a client can say about an escort is that she was robotic." Magnanti then brushes aside the chances that those who frequent prostitutes, will also want to have sex with robots,” It’s only ever going to be a minority of people, the love doll people, who want a Flesh Light that talks to them” (ibid.).

As the world witnessed in Barcelona, “robot brothels” certainly did shake up the industry when they first arrived. Today, in the same city where these brothels were once protested by the local trade union, escorts work alongside sex dolls for the same rates. The attitude of the human workers towards their synthetic counterparts seems to have shifted towards one of acceptance, bordering on indifference (VICE). The following statements are from sex workers employed at two Barcelona brothels: Lumidolls, which features sex dolls and human workers, and La Suite, a high-end establishment that does not have sex dolls or robots.

> "At the beginning it was weird because it was different. After, you learn to get used to it and you learn to work with these tools... it's not the same profile of client, the ones that come for a girl or come for a doll."
>
> -Sex worker, *Lumidolls*
>
> "It's strange but there's so much fetishism, so many weird things that this isn't so weird. It doesn't offend me because those looking for dolls are looking for something else."
>
> -Sex worker and porn actress, *La Suite*
> *The First Sex Doll Brothel in Europe*, airdate 11 Dec. 2018 (VICE)

Both sex workers seem acclimated to the presence of dolls in the industry, and their views on the clientele the dolls receive mirrors Magnanti’s intuitions.

2.7.3 Philosophy and Robot Rights

This last topic is on the rights of robots, and other ethical discussions. While making up a sizable portion of academic writings on sex robots (Döring, et al., 2020), this topic will be given brief treatment, for the fact that philosophical discussions on sex robots are speculative, subjective, and open to unending debate. However, that does not mean that they are no less important to consider. David Mainenti writes, "Humans engaging in sexual interactions with robots could well become the catalyst that forces a larger, global community to address the rights (or lack thereof) of humanoid creatures in general” (Mainenti, 392). Mainenti speculates that this group will push the need for conversations regarding the possibility of android rights, and kick-start deliberation for best practices and regulation (ibid.). Mainenti posits that regulation will likely flow from state and federal levels if:

A. the level of interaction mimics human relationships and sexual interaction; and/or
B. more social harm is done by letting the industry manage itself (ibid., 392).

In 2018, Saudi Arabia famously granted citizenship to Sofia, the robot android from Hansen Robotics, at the Future Investment Initiative Forum in Riyadh (CIC). A few years later, it is still not clear what rights and benefits this citizenship carries (Walsh). Given what we know about the nation's laws, the same platitudes are not likely to be extended to sex robots (Amuda & Tijani). Levy urges that "The time is fast approaching when the theoretical debate must evolve into laws, and the consequences of those laws will be staggering" (Levy, 2016, 4).

There is legislation in Europe on robotics, however these laws are mostly tort, or focus on ethical conduct and liability rather than prescribe any legal status or assignation of rights for robots. In 2016, the Scientific Foresight Unit of the EU's Parliamentary Research Services conducted a study to help guide lawmakers on future ethical aspects of Cyber-Physical Systems. The study urged for an ethical framework for the design, production and use of developing technologies (EPRS, 37). These recommendations would lead to the formation of the EU Civil Law Rules on Robotics. Subsequent commissioned evaluations into this piece of legislation would make further recommendations. In 2017 the European Union's Legal Affairs Committee established a working group to examine legal implications raised by advancements in robotics and artificial intelligence. The results included a proposal for "introduc[ing] a system of registration of advanced robots that would be managed by an EU Agency for Robotics and Artificial Intelligence" (Delvaux, 8). The following year, another JURI commissioned study on the Civil Law Rules on Robotics took issue with the standard definition of a ‘smart robot’ as “one which has autonomy through the use of sensors and/or interconnectivity with the environment, which has at least a minor physical support, adapts its behaviour and actions to the environment”, since it can be loosely applied to many robots in existence today (Nevejans,10). Sex robots already meet the first of these requirements, and there is no reason to indicate that they won’t soon meet the latter. Regarding matters of artificial consciousness, the study urged, "It would appear necessary to establish a principle whereby any scientific research intended to instill consciousness in a robot, or indirectly having this effect, would be deemed potentially dangerous to humankind and strictly regulated" (ibid., 13).

Whether an artificial consciousness can be manifested will no doubt be one of the singular greatest pursuits of science. Should artificially conscious agents be granted rights? Do *we* have the right to decide who and what can and cannot be given consciousness? These discussions have taken place within the philosophical arena since the 1960s (Scheutz, 217). Today, more than half a century later, it feels that society is closer to moving that debate from the hypothetical to the practical. In the conclusion of “Robot prostitutes as alternatives to sex workers”, Levy addresses the potential application of artificial consciousness to sex robots, and asks,

> Should they then be considered to have legal rights and ethical status, and therefore worthy of society’s concern for their well-being and their behaviour, just as our view of sex workers is very much influenced by our concern for *their* well-being and behaviour? (Levy 2007, 6).

However, whether it is ethical to bestow consciousness to a sex robot *to begin with* is the larger issue at stake. The immediate problem is that artificial consciousness in a sex robot is tantamount to slavery and forced prostitution (Richardson 2016; Frank & Nyholm, 322). Another concern, as Frank & Nyholm predict, "sex robots are among the likely candidates for robots into which this technology might be incorporated" (ibid., 314). As stated in the introduction, no other industry seems to be working harder to deliver life-like, humanoid figures, infused with a spectrum of believable personality types.

Clearly, there is much to come, for the future of sex robot technology, as the preceding literature review shows. For nearly every possibility, there is a discourse, with positives and negatives, proponents and detractors. Therefore, it is crucial to form a robust, multi-faceted view of these possible futures.

3. Methodology

3.1 Introduction and Research Strategy

Problem

Sex robots are an emerging technology with the potential to move beyond consumer sexual gratification, but there is no clear oversight or standards when it comes to security, privacy or responsibility. In addition, this technology is cause for social tension and emotionally charged discussion, that some would wish to have banned altogether. These elements create an air of uncertainty regarding the future of this technology.

Objective

This study explores possible future scenarios for sex robots, created through data analysis of interviews, published literature, and articles. The purpose is to create useful scenarios regarding sex robot technology, while taking into account the different perspectives and factors of uncertainty presently surrounding the issue.

Research questions

1. What are future alternative applications for sex robots beyond consumer sexual gratification?
2. How can sex robots be detrimental or beneficial to certain industries, groups, or actors?

Methodology Chapter Outline

The interviews and scenarios are part of an overall comprehensive strategy, but for the purposes of clarity, the design process for the interviews and the scenarios will be outlined separately. This chapter will begin describing the overall research strategy, followed by a description of the interview process and design. Next is a brief description of how data was collected for the interviews, and how that data was analyzed to inform the scenarios. At this point the scenarios will be discussed- the strategy in using scenarios, which type of scenarios and why, and the process of how they were created. This chapter concludes with a discussion of ethical considerations and limitations in the research process.

Research Strategy

The main objective for this research strategy was to a) look for themes, common concerns, and perspectives from the interviews that could be b) reinforced with already existing literature, to c) investigate new roles that sex robot technology might have in the future, and the opportunities and risks these situations may bring. Primary data will be collected in the form of semi-structured interviews with a variety of stakeholders, and less formal discussions with relevant communities via online questionnaire. Themes will be developed from the interview transcripts through a typical coding process. At this point, secondary data will be collected from relevant literature, internet sources, and newspapers to provide supportive context. With the themes established, drivers of change, or "factors" can be determined. These factors are those which will have the most influence on the themes in the future. The factors will be given values, such as increasing or decreasing, that reflect the behavior of the factor. These behaviors are then considered in context with the archetypal narratives, developed by Jim Dator (2009), to form scenarios. Following the scenario formation, a Causal Layered Analysis will be applied to gain deeper insight into social aspects of each narrative.

Research Strategy Summary

1. Collect primary data via interviews and an online questionnaire.
2. Analyze interview transcripts & survey data for common themes.
3. Find published evidence to support these themes.
4. Use themes to identify underlying drivers of change, defined as *factors*.
5. Assign a *behavior value* to these factors (i.e., rising, falling; positive, negative).
6. Determine how the factors will behave within the archetypal narratives.
7. Form scenarios.
8. Apply Causal Layered Analysis.

3.2 Interview Process and Design

Interview Methodology

Robotics is a new branch of sex technology, with a landscape that is changing not just year to year, but month to month. Without a long history of established literature, it is beneficial to use interviews as they include an immediate assessment of the current landscape. Through dialogue we can project into the future; so much of Futures Studies relies on this aspect of human creativity and insight. In addition, the nature of the research questions implies subjective outcomes, in terms of benefits, risks, and concerns. Since the topic of sex robots has many different and often conflicting viewpoints, the interviews can be used to find meaning from individual perspectives.

Process and Design

The primary interview participants represent a panel of experts from multiple facets of the sex robot discussion. This includes proponents of sex robot use and critics of the technology; policy, ethics, law, and security are also represented. These areas of expertise are more thoroughly explained in the participant biographies.

The second half of the Literature Review helped to inform the questions that would be asked in the primary interviews. Taking the suggestions that had been offered up by contemporary research in and conversations playing out in the media, I formed questions that I felt furthered the discourse. Participants were given an Interview Guide with questions relevant to their field, exploring their thoughts and feelings on sex robots. Each Interview Guide was designed around 3 to 4 groups of questions that allowed for the most creative and impactful answers. These guides would be used to drive semi-structured interviews and were given to the participants in advance to the interviews taking place.

Interview Participants

Dr. Marianne Brandon - clinical psychologist, sex therapist, and author focusing on the future of human sexuality and technology, with several presentations on the topic, including "Robosexual: The future of human-robot relations" at the 2019 SAPO Web Summit.

Ezio Di Nucci - Professor of Bio Ethics at the University of Copenhagen, author of several papers surrounding sexual rights and disabilities (including "Sexual Rights, Disability and Sex Robots"), and a contributor to *Robot Sex: Social and Ethical Implications* (MIT Press, 2017).

Caitlin Roper - PhD candidate at RMIT University and campaign manager at Collective Shout. Her research covers female sex dolls and gynoid sex robots, having recently presented "Sex Robots: Implications for Women and Girls" at the Coalition to End Sexual Exploitation Global Summit.

Kate Davis - member of the Campaign Against Sex Robots, and London-based artist whose multimedia work explores human sexuality and robots through immersive visualizations.

Amie Stepanovich – specialist in domestic surveillance, cybersecurity, and privacy law, who has worked on many U.S. policy projects, and a leading member of several privacy-related national advisory committees in the United States.

Ryan Calo – Assistant Professor at the University of Washington School of Law, and former research director for the Center for Internet and Society. He currently co-chairs the American Bar Association Committee on Robotics and Artificial Intelligence. His areas of expertise are privacy, robotics, and emerging technology and how they relate to law and policy.

RenderMan – hacker and founder of the Internet of Dongs project, which provides consumer information about security, privacy, and safety of sex devices, and critically reviews sex tech devices for security vulnerabilities.

3.3 Questionnaire Process and Design

The motivation behind the questionnaire was to gather opinions on sex robots directly from the disabled community. In Futures Studies, we often ask 'Who is not in the room?' (Inayatullah, 2015). Throughout my research I came across the suggestion that sex robots could be used to help people with disabilities that prevented them from achieving sexual gratification[7]. Despite the best of intentions, these suggestions were nevertheless coming from able-bodied researchers, and not from members of the disabled community. I did not have a particular hypothesis I was hoping to prove, or disprove, I only wanted their voices to be included, as they were so often represented in projections of sex robot futures.

Process and Design

The questionnaire, titled Sex Robots: Opinions and Thoughts from the Disabled Community, was drawn into three parts. The first part asked participants about their attitude on the use of sex robots in general. The second part gauged opinions on sex robots, sex workers, and sex care programs. This section was included since it reflects current programs that provide sex care to people with disabilities (see: EPSEAS programs in Europe), and a likely practice that sex robots serving the disabled would be incorporated into. The last part of the questionnaire asked participants about sex robot design features that were important to them. The motivation for this was to determine which, if any, design features reflected the specific needs of people with disabilities. Finally, there was room left to discuss the topic, and indicate how they felt about the suggestion that sex robots ought to be used for helping people with disabilities achieve sexual gratification. All questions were optional, and formatted in a variety of ways including, multiple choice, checklist, and open-ended short answer questions.

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[7] While the elderly are frequently mentioned alongside the disabled as suggested users of sex robots, I did not feel compelled to include this cohort in a survey, for a few reasons. First, the present-day cohort (aged 75+) will be displaced by a different population (presently aged 50-75) in the future. Furthermore, that cohort representing the elderly demographic of the future, often referred to as the Baby Boomers, already have a different view of robots in respect to the generation before them (see Street-Porter).

The questionnaire was created through Google Forms. Google Forms is an online application that allows users to create and distribute surveys with results updated in real time. The advantages of this service are multiple question types can be formatted without previous design knowledge, the forms are hosted on a trusted server, and a sharable link is generated for easy distribution. Personal identifying information was not collected, (i.e., names, locations, email addresses), and participants were allowed to view the collective results.

Copies of the survey questions and responses can be found in Appendix 3

Questionnaire Participants

This questionnaire was a cross-sectional study of people with disabilities actively concerned with how their disability affects their sex life. The sample was drawn from a population of members to online message boards related to sex and disabilities. The questionnaire was distributed to sex-positive discussion groups centered around people with disabilities. An introductory text and link to the survey was posted to the r/DisabledSex and r/DisabledSexWorkers boards on Reddit.com and asked that only members of the disabled community participate. This was done in hopes that the questionnaire would reach the appropriate cohort best suited for participation and increase reliability of the results. See Ethical Concerns for more on this matter.

3.4 Data Collection

Interviews

Primary Interview subjects were given the choice of platform that they were most comfortable with. To respect the interview participants' various abilities, time zone, or language capability, the interviews took place over a variety of platforms and media, including video conferencing, emails, and phone calls. All audio was recorded and transcribed.

Questionnaire

As mentioned, the questionnaire was hosted online through Google Forms. After the questionnaire was posted to the appropriate online forums with an explanatory text, it was left to run for over a month. Occasionally, the post containing the survey was refreshed, in order to attract new user engagement. Once the research period was over, the results were already aggregated and visually displayed.

3.5 Primary Data Analysis

Thematic Analysis

The transcripts for the interviews were gathered and ran through a typical coding and categorization process used in qualitative data analysis. Time was spent looking for keywords, common ideas and anything that seemed to be a repeating pattern. Following this, codes were grouped into categories. By looking at how these categories connect or interact with each other, themes were established. Following the distillation of themes from the interviews, I returned to the literature, editorial articles, and contemporary media to find sources which supported or reinforced these ideas and gave indicators of what to expect regarding the behavior of these themes as trends.

For example, several people talked about the impact of male-oriented design of sex robots, and the importance of moving away from the hyper-sexualized female form. I found a talk given by sex robot researcher and author Kate Devlin on this same topic, and then found sources which discussed the trend towards abstraction in sex toy design, indicating the trend to be a result of more women entering into the production process of sex tech manufacturing.

3.6 Scenarios

Scenarios Methodology

I have selected the Four Archetypes method developed by Jim Dator at the University of Hawaii, Manoa (Dator, 2009). This method relies on a theoretical framework that the stories we, as a society, tell ourselves about the future often fall into one of four archetypes. These archetypes are:

- Continued Growth
- Collapse
- Discipline
- Transformation

Continued Growth is often considered the Business-as-Usual scenario. It is a projection of current circumstances if they are allowed to continue uninterrupted. It is an enhancement of trajectory, extrapolating on present-day technologies but also carrying current social conflicts into the future.

Collapse is a future where the system we are considering reaches its limit and can no longer thrive or function. This can be applied to economies and ecologies. In this case, collapse will be represented by a universal ban on sex robot technology.

Discipline is a future that is sustainable, one where the system remains in balance, but often due to adopting rigorous standards, policies, and policing. Harmonious, but potentially bureaucratic and rigid.

Transformation is a radical departure from the present, a shift due to a transformative social movement, event, technology, or phenomena. This is where we often put our idyllic aspirations for society but is not entirely utopian. (For example, womens liberation and civil rights movements in the past were catalysts for transformative social change, yet inequalities persist).

The Four Archetypes method was specifically chosen for this study due to its flexibility, and purposeful intent of seeking out themes. I say ‘flexible’ because this method can be applied to various forms of data analysis -in this case, interview and literature analysis- rather than being reliant on a workshop process, as is common with other scenario formation methods. Another reason I have selected the Four Archetypes, is because the narratives are generic, neither good nor bad (Dator, 2009, 7). This pairs well with the conflicting attitudes and controversial atmosphere of this topic.

Given multiple dimensions of uncertainty, comparing the scenarios allows us to determine the underlying factors that drive change. Scenarios allow us to foresee potential consequences and gives stakeholders the opportunity to develop comprehensive solutions to potential problems or concerns ahead of time. Scenarios also show us how different groups of people are affected in different situations. Creating scenarios is a way to include multiple viewpoints into one document without having to advocate for any single vision. Each scenario could represent a preferred future for someone and should give indications for how to protect their best interests.

Scenario Process & Design

The scenarios are formed by taking factors gleaned from the interview analysis and placing them within the Four Archetypes previously described. The factors are derived in the following way: Once the themes and trends have been identified from the interview analysis, drivers of change are considered. These drivers of change are "factors" that will have the most impact on the state of these trends in the coming years. Using the example from earlier, we have male-oriented design identified as a theme, alongside the trend of women entering the design side of the sex tech industry. More perspectives entering into the design process -be they female-oriented, ethically oriented, therapy-oriented etc.- will create a proliferation of design ethos and impact the status of the male-oriented sex robot market. In this case, 'proliferation of design' can be used as a factor to influence scenario outcomes. With the factor identified, behavior values are assigned, in this case, increasing or decreasing.

This process is repeated with the other themes and trends, until enough factors to create compelling scenarios are assembled. The factors' behaviors are then considered within the context of the archetypes, by asking questions like, "What will increasing design proliferation look like within the Transformation narrative?" or "What are the consequences of decreased design proliferation within a Disciplined society?". By answering these questions, using all the factors and archetypes, the story of our scenarios begin to take form. Crucially, these narratives cannot be written without reference. They should not come from the imagination entirely, and ought to be supplemented with existing literature, reports, and publications that support each narrative (Fergnani, 2020).

It should also be mentioned that for this project, one of the scenarios, Collapse, employs an additional Futures Studies method known as back-casting. Backcasting, as it is used by Elle Boulding, is a way of 'remembering history' from the point of view of the future (Boulding, 54). By working backwards in small increments from a point in the future, backcasting tells the story of how an end was reached. Backcasting is a tool often used in Futures Studies as it allows strategies to develop and makes an insurmountable future appear more tenable.

3.7 Final Scenario Analysis

Discussion and Causal Layered Analysis

In Chapter 6, each of the narratives will be discussed, providing references that served as inspiration to the story elements, and how the factors were expressed.

Following this, a Causal Layered Analysis (CLA) is used to provide deeper understanding of the different scenarios. CLA, developed by Sohail Inayatullah (1998), is a Futures Studies method for exploring deeper forms of meaning and context for a given topic, set against the social constructions of that time and place. Applying Causal Layered Analysis to multiple scenarios, allows us to interrogate the deeper issues that separate them. What parameters allow one scenario to form over another? What systems or worldviews allow those parameters to gain traction? CLA, like scenarios, is less concerned with predicting the future, so much as opening the present to the possibility of alternative futures (Inayatullah, 2005). Scenarios show us a picture of alternative futures; CLA goes beyond the superficial snapshot, to uncover the more meaningful changes necessary for those futures to thrive.

A Causal Layered Analysis is divided into four levels or “layers”: litany, system, worldview, and myth. At the litany level we are presented with details, statistics, facts, and figures- the headlines of the day. They provide a straightforward picture of what is happening, without too much insight into the mechanisms surrounding the story. Essentially, the effect without consideration to the cause. The secondary level, system, looks a bit deeper into the surrounding melee. Different functions are considered: historical factors, market effects, cultural identities, political discourse, etc. The worldview is at a deeper level, and bluntly states what legitimizes power, attitudes, and beliefs. This level goes beyond specific actors and stakeholders and deals with that which is culturally or systemically ingrained. It could be religious perspective, or the after-effects of colonialism; it is deeply rooted. The myth is a shorthand metaphor to describing the worldview, and changes depending on the community in perspective[8]. It is the story people tell themselves and is oftentimes unconscious. The purpose of establishing the myth is to separate ourselves from potentially problematic truths, and to create the opportunity for a new story to be told. This allows communities to challenge power structures and modes of thinking. In this way CLA is a poststructuralist method (Inayatullah, 1998; 2005).

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[8] As an example, when headlines broke about the murder of George Floyd and the subsequent public demonstrations, that was the *litany*. The content of the discourse that took place within Black Lives Matter or across different media was regarding the *systemic*, with the ultimate goal of changing the *worldview*. At this point, the *myth* would have been different for police officers or people of color, or even police officers of color.

3.8 Ethical considerations

All interview participants were sent a written formal invitation to participate in an interview, which stated the research topic, purpose, and scope. The invitation also included the Interview Guide, to make the participants comfortable by knowing what would be asked ahead of time, and not feel ambushed by any "gotcha moments" or uncomfortable questions (see: Interview Guides, Appendix 2). These invitation letters concluded with a Privacy Statement granting them the right to evoke anonymity (see: Privacy Statement, Appendix 2).

As for my own influence on the participants possibly compromising the results, to the best of my knowledge, this was not an issue. I do not have any reason to believe aspects of my identity would have influenced anyone, as I did not reveal much about myself. I kept my interjections to a minimum and made a conscious effort to not appear to agree or disagree, or to display enthusiasm or disdain. I focused my communication during the interview on moving through the questions, obtaining clarification, and conveying comprehension.

The questionnaire participants were contacted through online forums, and presumably read the post that contained the survey link. The forum posts introduced the research topic, purpose, and scope, and included a privacy statement assuring participants that no personal data would be collected. All survey questions were optional. As no personal data was collected, it is not possible to verify whether all the participants were appropriate candidates to take the survey. I will concede that I can only assume that the results are from valid sources and did my best to assure that this was the case.

For this questionnaire, an additional website was created[9] to share and distribute the survey link outside of the online forum format. This website included the Privacy Statement and links to community resources. In the interest of being neutral, a link to the Campaign Against Sex Robots was included in the resource list, so participants could have the ability to learn more about the arguments against sex robot technology.

Section 4.3.4 features a table (Table 4) sourcing the document "Ethical and Legal Implications of Sex Robots: An Islamic Perspective" by Amuda & Tijani (2012). The table lists acts with robots that could be interpreted as crimes under Islamic law, and their possible punishments. I had debated whether to include the table, for a few reasons. First, it is clear the document was either a translation, or that English was not the first language of the authors, and so there is room for possible misinterpretation. I checked what statements I could against the Islamic sexual jurisprudence directory on Wikipedia[10]. Typically, I would not use Wikipedia as a valid source, but for this purpose, the crowdsourced nature of the contributions felt appropriate, providing a consensus that does the work of cross-referencing years of scholarly and religious texts that I did not have the resources or linguistic capacity investigate on my own. The table does not reflect all Muslim attitudes, nor should they be taken as necessary outcomes within Muslim communities. I ultimately chose to include the table because it effectively conveys the seriousness of very real possibilities that someone could be confronted with, depending on the attitudes of their community.

Finally, an additional statement should be made regarding the inclusion of mass media and local news sources in the Literature Review. In these instances, I took care to only retrieve factual information that could be corroborated from other news outlets, or direct quotes from interviews within the articles. Due to the nature of this emerging issue, these local outlets were oftentimes the only or original source reporting particular stories (such as the Australian man who married his robot). Other times, the very nature of the headline was used as data. To this end, I want to acknowledge that while I recognize many of these media outlets can be biased or unreliable, with pieces obviously designed to be emotionally evocative, they do represent the everyday litany within their local communities, and for this reason, are included as part of the Literature Review.

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[9] http://SexRobotSurvey.odie.us

[10] https://en.wikipedia.org/wiki/Islamic_sexual_jurisprudence

Chapter 4. Analysis and Findings

4.1 Introduction

In this chapter, I will begin with data analysis of the online questionnaire results, as it is more quantitative in nature and thus easier to interpret. From there, thematic analysis from the interview transcripts is laid out and supporting literature provided. An interim summary of the findings is included. The chapter concludes with a description of the factors that were derived from the themes.

4.2 Questionnaire Data Analysis

Sex Robots: Thoughts and Opinions from the Disabled Community

The online questionnaire was intended to collect attitudes towards sex robots from the disabled community, specifically from those who have difficulties achieving sexual gratification on their own, or without assistance. The invitation to participate was distributed to online message boards specifically pertaining to sex-positive discussion for people with disabilities. Opinions were sought out from this community because they are one of the target demographics for whom sex robot usage has been suggested for. The questionnaire was divided into three sections: attitudes toward sex robots, attitudes toward sex robots and sex care workers, and sex robot design features. The findings are as follows:

The most significant finding from the first section, and perhaps the entire questionnaire, is regarding Q3. *Would you consider having sex with a robot, if recommended to by a professional as an alternative means of physical therapy (for muscle training, stamina building etc.)?.* While one-third of respondents answered "No" or "Maybe" to Q1. *Would you consider having sex with a robot?*, 95% of respondents --all but one-- answered positively to Q3. Meaning, they would consider the act, if under the recommendation of a professional or for the purposes of physical therapy. From this we can deduce that this sample group is much more receptive to the idea when it is framed as a component of health, or reduced to the physical act, with the masturbatory aspect removed. Though the questionnaire was from an admittedly small sample size (25 persons), we can extrapolate that this attitude would carry over to a larger population sample when we see an overwhelming majority response. It would be worth investigating if this was true of the general population as well.

Another type of result we can extrapolate from, is where we see an even split in the responses. This indicates that there is likely to be a similarly even distribution within the larger cohort. This occurred for Q8. *Which is your greater concern?* regarding comfort levels; 50% answered "being physically uncomfortable, 50% answered "being emotionally uncomfortable". This tells us two things. First, as mentioned, this even distribution is likely to be replicated in a larger population. Secondly, and more importantly, we should not assume of the disabled community that their needs would be primarily based around physical comfort. This tells us that emotional comfort is just as, if not more important, for many people.

This brings us to design considerations. When it came to design features, participants were asked Q.9 *Which features are important?,* Q10.*Which feature is the most important*? and Q11. *Which feature is the least important?.* The purpose of asking these questions was to investigate whether certain design features would emerge as being valuable to potential users with disabilities. Participants were given a list of 10 design features and encouraged to check all that apply to Q9, and select one feature for Q10 & Q11. Respondents were also given space to include their own feature suggestions. Two results are to be noted. Firstly, a large majority (91%) of respondents selected "Body Warmth" as an important design feature in Q9, followed by "Remembers my specific needs" (81%) . We can assume these will be a somewhat important feature to disabled consumers, as they had the largest overlap of the sample group. The second finding comes from comparing the answers given for Q10 and Q11. Here it is shown that for nearly every feature that was the most important to somebody, it was the least important to somebody else. What this ultimately tell us is, when it comes to sex robot design, even within the same cohort, user customization will be of the utmost importance. We can further deduce that mass-produced sex robots, are not likely to be successful for this reason.

Luckily, the sex robot and sex doll industry is predicated on delivering a bespoke product to the consumer. For example, Emma, the sex robot from DSDolls and AiAiTech, is not bound to any physical constraints and comes with a choice of seven different faces (with asian or caucasian features), three skin tones (brown, yellow [sic], and white), three eye-colors, a wide range of hairstyles, and the option of six body types which differ mostly in breast shape, waist, and height measurements. This high degree of customization also helps to serve the imagination. In a literature review of sex robots within the scope of HRI, Gonzalez-Gonzalez et al. noted that "Intimate fantasies are persuasive if they are customizable, which is a characteristic that can be considered in the design of sex robots. In this sense, there is a high prevalence of nonsexual, posthuman companionship dynamics between dolls and their owners" (Gonzalez-Gonzalez et al., 13).

4.3 Interview Analysis

The interviews yielded 6 major themes that were distilled into 3 factors. These themes are:

- Male Fixation & Orientation
- Sexual Rights and Sexual Needs
- Protecting the Vulnerable
- Security as an Afterthought
- Law & Liability
- Crucial Conversations

In this section we will cover the themes that participants discussed, and literature that supports their statements. In certain instances, sub-themes are included within the theme’s discussion.

4.3.1 Male Fixation & Orientation

Pornography & Patriarchy

One of the first themes to emerge from the interview analysis was that of the male orientation of the sex robot market. This factor is undeniable. Before we begin to discuss where sex robots might go in the future, we need to acknowledge why they exist. Caitlin Roper, campaign manager at Collective Shout, and doctoral candidate researching sex robots says,

> We know that the vast majority of sex dolls and robotic dolls on the market are embodied females, and typically with a very pornographic aesthetic. The buyers are overwhelmingly men, and the manufacturers -it's about 90-percent plus- are men. These products have arisen out of men's demand for lifelike dolls that they can use in place of living women, dolls that they can enact their porn sex fantasies on. - *Roper*

Kate Davis, a London-based artist known for her on-going photographic project with sex robots, as well as a member of the Campaign Against Sex Robots, points out the same:

> Let's question, why, as a society, do we have sex robots in the first place? We have these technologies coming to the surface, and if you're looking at the status of women in society, looking at the status of men in society, and looking at the power relations between them and understanding where this all comes from, then you don't you don't have to look far at all... to see who's the ones behind the making of these sex robots, and who they are made for. It always comes down to the same sort of person. - *Davis*

That the sex robot market is built around men, by men, doesn't come as a surprise. This is how the larger part of the sex industry operates. Dr. Marianne Brandon, a psychologist and sexual therapist,

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Note: The interviews are cited by the participant's last name. For those participants that also have works referenced in this paper, the citation format *Last Name, 2021* or (2021) indicates the statement is taken from the interviews conducted for this project. Parenthesis have been removed at the end of block-quote excerpts from the interview transcripts, with the participant's name in italics, for better legibility.

reflects on the idea that sex robots, like pornography, are designed to cater to male tastes. Brandon explains that sex robots and pornography both induce an effect known as 'super-normal stimuli'. This effect, could go on to widen the gap of the male vs. female sexual experience:

> What I'm most concerned about [is], in general, sexual robots are going to be more appealing to males and that's going to create some gender issues, or issues for couples. I'm not against sex robots at all, but I do think we have to recognize it's just like porn. So much of what sex tech can offer is more appealing to males, and males tend to engage in a wider variety of sexual activity anyway, so there's that piece. But the other piece that's not being discussed at all, is that sex robots are going to be an example of what we call supernormal stimuli. - *Brandon, 2021*

Supernormal stimuli are stimulus that are exaggerated forms of what is found in nature and exert a stronger pull than the originally sourced stimulus (Barrett, 3). Of course, as animals with a biological imperative to procreate, sex is one of the ultimate stimulating experiences nature offers. In the natural world, humans generally only contend with a small group of potential partners. Those partners will then go through a process of building relationships, and possibly a commitment to monogamy, before the sex act occurs. Pornography provides the sex, without the time or effort of relationship building alongside exaggerated forms and features, typically of female bodies. Over time, excessive exposure to pornography can lead to decreased relationship satisfaction, sexual dysfunction, and a host of intimacy issues (Cincotta). If sex robots provide a physical version of pornography, then there is certainly cause for preliminary concern. Brandon says that "in my practice at least, I can tell you that men are much more curious about trying out that stuff than women are, and so I do see that divide growing" (2021).

Roper goes on to say, now that sex robots have arrived, academics are trying to find alternative uses for them. For Roper, this attempt to legitimize sex robot technology only vaguely conceals their origins:

> [W]e're seeing academics proposing that sex dolls could be utilized for so many things: for use by the elderly or the disabled, or those struggling with social anxiety or grief, or loneliness. But I think these proposals function to justify the development of sex robots; taking products that are already being developed and trying to find a legitimate reason why they could be good, rather than considering the inherent misogyny, the objectification, dehumanization of women, and the possible harms to women and girls. - *Roper*

Bioethics professor at the University of Copenhagen, Ezio Di Nucci, who wrote about sex robots and the rights of the disabled, also admits that the circumstance of the male-oriented market is one of the biggest reasons to reconsider our progress going forward:

> If we assume that we are living, probably everywhere, under oppression, then it's very difficult to imagine that these technologies will not replicate and in fact reinforce patriarchal oppression. I think this issue is one that I would be open to consider as a reason for not further developing these technologies.
>
> Think of it this way, the average nerd tends to be male and white, and if you think of the algorithmic bias debate[11], applied to sex robots… we are very likely to get technologies that will replicate and reinforce patriarchal oppression. - *Di Nucci, 2021*

Unfortunately, design of sex robots thus far, is not based on, or influenced by, any ethical or moral principles. In a review of published sex robot literature, researchers found the largest motivator of sex robot design was the market (Gonzalez-Gonzalez et al., 8-16). With that market being almost exclusively male, it comes as no surprise that the review found studies in the field regarding design are aimed at deducing which qualities *men* will find the most attractive. "There has been a greater interest in the opinion of human users within the past ten years, more specifically, in men, about how a sex robot should be designed" (Gonzalez-Gonzalez et al., 12).

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[11] Briefly, this refers to unfavorable outcomes in technology that reflect hidden biases of programmers, or a shortsightedness in design. Historically, this has resulted in racist and sexist outcomes, often preventing marginalized groups from receiving equal treatment, or singling them out for persecution (Heilweil).

Author Tanja Kubes cautions that considering sex robots solely from the heteronormative iteration they currently inhabit is too reductive and excludes the possibility of substantial change. While she whole-heartedly concedes to the arguments made about the misogynistic form of sex robots, she believes that dismissing or banning the technology entirely on these grounds is being too hasty. Instead, she argues that it should be taken as an opportunity to make better robots and take control over the means of production. Thus, infusing the technology with a sex-positive perspective that caters to the entire spectrum of human sexuality. Kubes writes, "queer interventions on robot sex can (and should!) contribute to nonhierarchical creative and interpretive construction processes that traverse, overlap and cut across sexual potentials without fitting into a normative unit." (Kubes 2019a, 7) She adds that by categorically dismissing sex robot technology as inherently bad, feminists are "giving away the chance to play a part in shaping technology with the potential of actually improving many people's lives" (ibid., 9).

While non-gendered and gendered (male and female) humanoid robots have long existed (Alesich & Rigby, 51; Robertson), the idea of a post-gendered robot was first introduced by Donna Haraway in her 1985 work "The Cyborg Manifesto". In it, Haraway uses the cyborg "as an empowering metaphor to deconstruct traditional dichotomies and social categories and uses technology to expand feminist traditions of liberating women from patriarchal oppression." (Lan, 4). Haraway's cyborg exists in a post-gender world, unshackled from the dualistic categorizations that have long defined and confined Western perspectives (Haraway, 67). Haraway, and more recently Kubes, push feminists to reexamine the utility of technology. From this perspective, rather than abolish this technology, feminists should overthrow it entirely, and stretch the boundaries of both technology and notions of gender.

This approach is similar to certain feminist approaches to the creation of pornography. Like sex robots, pornography has been heavily criticized and protested throughout the past half century. There has also been a movement to usurp the male gaze as the point of perspective in pornography. This approach focused on the content, process, and context of pornography, and compliments the stance Kubes suggests feminism should take against sex robots. John Danaher also champions this feminist approach to pornography in relation to sex robots, which is to reimagine and then make better (Danaher, 2019a). However, as Davis points out, thus far such efforts of ethical pornographers, while admirable, has limited reach and has not made much of a dent on consumer tastes. She says, “the mainstream stuff is what people watch and what dominates the web and people’s screens”. Connecting this to new forms of sex robot production, Davis says, “At the end of the day, the market for sex robots is going to be quite niche anyway, and the abstract style of dolls or robots would be even *more* niche”.

Ultimately, with a male-centric market that serves to benefit males, the idea of helping people, like the elderly or the disabled, ought to be seen through this lens. Roper doesn't mince words when she says,

> Many academics take a really gender-neutral approach to this issue. They talk about how sex dolls or sex robots could be used by the elderly, the disabled, or other vulnerable groups, but what I think that they actually mean is, *men* who are elderly, *men* who are disabled. All of this is on the premise that *men* have a right to sex or that they're entitled to sex. – *Roper*

Sexy toys for Angry Boys

Roper then takes the present discourse on sex robots a step further, and likens it to online male rights groups:

> [S]ome academics in the sphere talk about the problems of sexual deprivation or quote, "non voluntary, absence of sex" as bad things, as threats to people's health and well-being...you know, these are the same arguments being made by *incels. - Roper*

'Incel' is a relatively new term, shorthand for 'involuntary celibate', and is associated with an online community of typically straight, cis-gendered men who have not been able to find a sexual partner. The group is known for hateful and misogynistic rhetoric, and for promoting the idea of sex redistribution, or 'sexual Marxism'. Sexual Marxism, coined by the incel Reddit community, is a system by which every person is matched with a partner of similar income, status, and attractiveness (Jennings). Or simply, "government mandated girlfriends" (reddit.com). Roper's assessment is not too far off.

In an opinion piece for *The New York Times* titled, "The Redistribution of Sex", Ross Douthat discusses how sex robots fit into the incel argument for sexual redistribution. To Douthat, sex redistribution could possibly result as a confluence of Western political perspectives.

> The left's increasing zeal to transform prostitution into legalized and regulated "sex work" will have this end implicitly in mind, the libertarian (and general male) fascination with virtual-reality porn and sex robots will increase as those technologies improve — and at a certain point, without anyone formally debating the idea of a right to sex, right-thinking people will simply come to agree that some such right exists, and that it makes sense to look to some combination of changed laws, new technologies and evolved mores to fulfill it (Douthat).

Ultimately, the author concludes, or rather, laments, "Whether sex workers and sex robots can actually deliver real fulfillment is another matter. But that they will eventually be asked to do it, in service to a redistributive goal… feels pretty much inevitable" (Douthat).

To Davis, sex robot technology teaches men to use the robot, and thus women's bodies as "tools for men to release their anger". RenderMan, a sex tech security expert and hacker, points out that there is already a tendency for men to be abusive towards personal assistant devices like Amazon's Alexa, "they'll swear at Alexa, and call her names and that's a disembodied voice in a little puck". Giving people with such tendencies a sex robot could exacerbate abusive behaviors:

> Say some guy that has these misogynistic tendencies lives at home alone. He's able to yell at his Alexa, and yell at the robot. That's not gonna help him improve when he's out in the public. It's gonna make things more normalized for him... I could definitely see a bit of a degradation in decency. - *RenderMan*

In a 2018 article titled “Uncanny Vulvas”, author Diana Fleischman approaches this position from a different angle. Fleischman writes "Perhaps we should encourage some men to use sex robots. Men who get environmental cues that they're evolutionary dead ends disproportionately menace society". She goes on to discuss research indicating perpetrators of homicide and violence tend to be young, single, and lacking in resources to win mates. While Fleischman does not mention incels[12] by name, she does ask, "How many teenaged boys would be able to build up the resentment to commit mass shootings or suicide if they had a beautiful sex robot at home?". Though there isn't evidence that impulses to violence can be mediated through sexual release, evidence *does* indicate that the motivation to act violently can be tempered by repetitive environmental cues that communicate reproductive success is within reach (Fleischman). A sex robot could provide those cues (Rousi).

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[12] In 2014 self-professed incel, Elliot Rodger, went on a killing spree that ended the lives of 6 people and culminated in his own suicide. Rodgers' acts are glorified within the incel community, where he is referred to as 'the Supreme Gentleman'. (BBC News, 2018b)

Nicola Döring, who has written and co-authored a number of papers on the topic of sex robot technology, also sees a connection between sex robots and another men's rights group, known as the MGTOW community. MGTOW stands for Men Going Their Own Way, its members subscribe to male supremacist ideologies and gather primarily on the internet (goingyourownway.com). MGTOW users have been noticeably active in online sex robot commentary. Döring writes, "MGTOW members publicly celebrate female sex dolls and sex robots because they regard them as outperforming real women... and claim they will ultimately make women obsolete or at least, take away their sexual power over men" (Döring, 2021, 6). Döring comes to the (rather cheeky) conclusion, "One could also argue that misogynistic men voluntarily turning to artificial companions might not be a negative outcome" (ibid.).

Jokes aside, giving these dejected males a sex robot and eliminating them from the dating pool is probably not realistic. More importantly, it obscures the issue of condoning misogyny by essentially rewarding bad behavior, or at least attempting to pacify it. Providing sex robots for these purposes goes back to the argument about whether or not this is feeding in to a dynamic that Roper points out as being "quite manipulative", that some arguments for sex robots, like the one above come off as "a warning that these men could become a significant source of social instability, if they're not given access to sex robots" (Roper).

As mentioned previously in the Literature Review, Bendel has suggested that sex robots could be supplied to men in times of war, suggesting that their presence would lessen the demand for local prostitution, and deescalate situations that could potentially lead to rape, torture and sexual slavery (Bendel, 2021, 7). In the context of Roper's assessment, the ethical question remains, is this merely pacifying a learned social behavior or an attempt to deal with a facet of human nature, evidenced by thousands of years of history? Or does this line of questioning completely miss the mark, and overlook healthy sexual functioning as a component of personal well-being, that in turn affects behavior, irrespective of gender?

4.3.2 Sexual Attitudes - Rights, Needs & Well-being

Sexual Needs vs. Sexual Rights

In 2017, on the topic of sexual rights, sex robots, and the disabled, Ezio Di Nucci made a meticulous case for the use of sex robots by setting forth that a) Sexual satisfaction isn't appropriate to the discussion of rights; b) Sexual satisfaction does not generate rights entitlements; but if we are to provide sexual services for the mentally and physically disabled, a case for using sex robots can be made since c) We ought to prioritize a person's negative right to self-determination (to not engage in sex acts), over somebody else's positive right to sexual gratification (DiNucci, 2017, 78). In this light, the sex robot could be preferable to a caregiver or a sex worker having to perform sex acts with the disabled person requiring assistance.

In 2021, during our interview, Di Nucci turns over this line of thinking, from a new vantage point, putting forth, “I'm afraid that the very idea of the ‘fulfillment of sexual needs’ might be a kind of patriarchal oppressive idea.”

Both participants that were critics of sex robots, stated directly that they did not believe in so-called "sexual rights", as they relate to this discussion.

> My biggest concern is, well, I don't believe that sex, or sexual access to another person's body is a human right. Obviously, it becomes a bit more complicated when it's not another person's body, when we're talking about a sex robot. - *Roper*

When asked if denying sex robots to those who wanted them is denying them their sexual rights, Davis responded,

> Sex is not a right for anybody. Society makes -well- *patriarchy and men* make it seem like it's their right, but nobody's *going to die* without having sex. I don't think it's anyone's right, if some people want sex, other people shouldn't be forfeited for that to be accessed. - *Davis*

It is important to point out that, without suggesting anything, sexual rights came to mean, within these conversations, the right to have sex when it was desired, or the right to demand sexual access or services in some form.

Sexual rights, as they have been outlined by multiple institutions and NGOs, are rights to personal bodily autonomy, the freedom to make choices accordingly, and access to sex education and healthcare. The World Health Organization describes sexual health as a "complex web of factors" and treats sexual rights as a component of human rights (WHO, 2014; 2015). This includes the right to choose one's partner, to engage in a consensual marriage, and to pursue a safe, satisfying, and pleasurable sexual life, free of coercion, discrimination, and violence (WHO, 2015). The World Association for Sexual Health, a network of over 100 international sexual health-related organizations, convenes yearly under the World Congress of Sexology. The product of their congressional meetings is the "Declaration of Sexual Rights", first proclaimed in 1997. Of the 16 statements, the 8th: "The right to enjoy the benefits of scientific progress and its application", applies most to the conversation of sex robots (WAS).

Sexual rights, in this regard, have more to do with dignity, to respecting the voices of others, and expecting the same in return. Bioethics professor Dr. Nancy Jecker believes that should sex robot technology become widely available, providing access to certain segments of our population, is a necessary step towards respecting their dignity. She argues,

> [S]ociety ought to make reasonable efforts to ensure access to sex robots for older adults with disabilities that impair sexual functioning. The crux of the argument is that our sexual desires are not mere desires; for many, they are fundamental to a sense of who they are as human beings. To shun people's sexual longing or behavior, or to leave people who struggle with disabilities that impair sexual functioning to fend for themselves, conveys a lack of respect for persons. (Jecker, 28)

To be fair, the participants I spoke to against sex robots did not in any way suggest that these groups ought to "fend for themselves", as Jecker puts it. Instead, they stressed the importance of embracing human contact and fostering meaningful relationships.

4.3.3 Protecting Vulnerable Populations

Value Driven Frameworks

For those that are against sex robot technology, providing robots to the elderly and disabled side-steps the problem. Davis says providing sex robots for vulnerable groups is "a bit of a cop-out", explaining that,

> People who are more vulnerable in society, they need the extra care, they need the extra input, time, and empathy from human beings. It feels quite wrong to think that something that isn't a person could substitute a real person, as if they're not worthy or deserve human attention. - *Davis*

Responses to the disability questionnaire echo the same sentiment. As an anonymous participant submitted, "while it may be great for people that can't find other people for either relationships or sex, it sends the message that people with disabilities are ultimately undesirable," fearing that sex robots being associated with the disabled would further perpetuate the idea that disabled people are so compromised, so "destroyed by their disability" that they can't engage in sexual activity with the able-bodied population. Roper also champions a human-centric approach:

> I don't believe sex robots are solving these problems, I think they're actually preventing us from finding solutions... rather than having to consider the particular social groups in mind, what their needs actually are, or a nuanced approach to how these needs could be met, or even restructuring things and encouraging a sense of community...
>
> A lot of these sound like quite naive and far-fetched proposals. All premised on the idea that an object with penetrable orifices can replace a living woman, or that owning a product can cure loneliness - *Roper*

This attitude of addressing human complexity with a product, is similar to handing out medication in lieu of therapy. The other participants were in agreement that, if we are going to be introducing sex robots as a therapeutic tool, then addressing vulnerability is paramount. DiNucci maintains that this is the perspective we ought to be approaching this technology from:

> The technology offers us ways of being very, very precise about vulnerability... You could think of the sexual technology in terms of personalized medicine… it does offer us the hope of meeting exactly the vulnerable needs of each of these groups - *DiNucci, 2021*

There have been steps in this direction, to provide this type of individualized patient-first care. Poulsen, Fosch-Villaronga and Burmeister explore how the insertion of robots into the healthcare field impacts codes of conduct amongst healthcare staff. Their work is framed through the lens of robots serving elderly LGBTQ+ patients (Poulsen et al.). The authors suggest a value driven approach to AI design, where cyber physical systems and robots are able to make in-situ decisions in accordance with the user's values. This approach, called VMD (Values in Motion Design) would rely on designing intrinsic behaviors that are based on applied ethics, laws, and most importantly, draws heavily upon *learned* individual and community-based values, in order to provide patient-centric care (ibid., 9-10). In this way, a robot serving an elderly LGBTQ+ patient would learn how to differentiate and address needs that may not be as important, or even exist, for elderly heterosexual patients. In 2019, Wynsberghe & Li looked at how bots -embodied and otherwise- could be integrated effectively into healthcare using a model that is care-centric, takes ethics into consideration, and values accountability. Their framework, HRSI (Human Robot System Interaction) is an alternative to HRI, that emphasizes a systemic approach (versus 1-on-1 interactions between the human and the machine) and provides a means for making better assessments of pre- and post- bot systems integration. The HRSI framework and VMD are pragmatic steps in the right direction.

Kate Davis says that proposals to incorporate sex robots into healthcare come at a time where human care workers are sorely needed. "It's unfortunate timing and more of an issue with the healthcare crisis, especially in the UK, with people not going into that line of work and we need them more than ever," she says.

Unfortunately, not only is there an overall lack of available caregivers, those who are providing services can sometimes do more harm than good. When it comes to reported elderly sexual abuse, 80% of the time it is perpetrated by caregivers themselves, and often within the environment of a nursing home (nursinghomeabuseguide.org). Victims of elderly abuse are often prone to difficulties in communication, confusion, and memory loss, which makes the problem under-researched and likely to be under-reported as well (Lino, et al.). Caregivers are also sometimes susceptible experiencing to abuse *from* their own patients- especially the elderly (Peck). There are agencies set up to protect senior patients from abuse, but caregivers are usually not afforded the same protections. Unfortunately, the caregivers most susceptible to abuse from a patient are oftentimes a family member, typically aging female relatives and partners, that are ill-equipped to perform all the required care services thrust upon them (Ayres & Woodtli).

Perhaps sex robots can absorb aggression and mistreatment from patients and help shield stress from non-professional caregivers. Could sex robots stop frustrated dementia patients from abusing their wives and daughters? Not likely. Could a sex robot be programmed to automatically report signs of abuse? Absolutely. Humans are unpredictable, we don't know if someone will respond in a particular way, and it's hard to screen out the possibility of abusive behavior. With robots, we can at least program them to perform controlled actions in response to specific behaviors. DiNucci's sums this point by saying:

> The control over the human carer is just guidelines and regulations, and the fact that they might get in trouble and get fired. While the control over the non-human care is a question of programming, and even if we're talking machine learning, artificial intelligence and programs that reprogram themselves. Obviously, that gives us so much more control, in principle, over human carers - *DiNucci, 2021*

That isn't to say that robots are impervious to error and risk, just that when compared to humans, there is a degree of control and a guarantee to certain ends. In 2017, DiNucci wrote,

> [R]obots can be programmed so as to minimize, if not eliminate, the risk of abuse; because robots can be controlled and monitored more effectively than human carers; because—as we are talking of pure sexual care rather than psychological support or other kinds of assistance—one can imagine that robots could be designed to be more effective performers than human carers in all sorts of respects. The vulnerability of the severely disabled is of paramount importance and must be protected at all costs—but that is true whether we deploy human carers or robots (DiNucci, 2017)

New Vulnerabilities

We may be able to account for programmed robot behaviors, but what of their unintentional effects, that lay in the human response? Circling back to the topic of supernormal stimuli, Dr. Brandon worries that such heightened experiences with sex robots might create a new type of vulnerability in users:

> It is the case that sex robots are going to be more satisfying in certain ways than a human partner. They're going to be able to stimulate people in more consistent ways or intense ways that human partners may not be able to replicate. Plus, people who are engaging a sex robot are going have more license to go to explore different kinds of sexual activities that maybe a human partner wouldn't want to.
>
> Now the issue there, from a psychologist perspective, is that human being is going to be able to potentially reach levels of vulnerability with a robot that they're not able to reach with a human. And vulnerability is a critical piece of intimacy; it's what makes sex exciting, and what keeps couples together. - *Brandon, 2021*

Brandon goes on to say that these new supernormal sexual experiences, taken upon primarily by males, will lead to consequences mirroring those of pornography: drops in willingness to be vulnerable and practice intimacy with other people. Cincotta explains that since pornography as supernormal stimulus creates "the opportunity to watch whatever they want, well then obviously real-life encounters will be less satisfying. Thus, one becomes less likely to want to engage in real-life intimacy." If 'watch' is replaced with 'do', then we see how sex robots could cause potential harm. These risks go far beyond relationship management. Studies have shown that once pornography consumption becomes an addiction, the effect of the supernormal stimulus tends to effect *neuroplasticity,* the brain's ability to readjust and organize new neural pathways (Hilton Jr.).

Another effect that sex robots could have on human brains, has to do with what is called 'sexual imprinting', which forms around sexual experiences in early childhood. In a 2019 web summit on future technologies and society, Brandon gave a talk on the topic of sex robots. At the beginning of the discussion, Brandon reveals that she believes children born today could very well go on to have their first sexual experience with a robot; a forecast that is likely to become as well-known and referenced as David Levy's 2007 prediction on people marrying robots within 50 years. The effects of minors engaging with robots in a sexual manner could have life-long effects. Brandon explains to the audience:

> What we know in sexual medicine is that, for all of us, at an early age, when we first feel sexual stimulation, that has a risk of imprinting in our brains, such that, it's what will turn us on, potentially for the rest of our lives...that's an element of what is called 'sexual imprinting'. What that could mean, at least for *some* people, is that if their first experience of sex is with a robot, that could get imprinted for them as their love map, and that's what they will seek instead of humans. (Brandon, 2019)

Brandon is quick to tack on the disclaimer that this wouldn't necessarily be the case for all children exposed to robots, or particularly widespread, "Now I don't think that would happen across the board, so I don't want to be alarmist, but it is a risk, and it's something that we have to be aware of" (Brandon, 2019). One of the main characteristics of sexual imprinting is that it occurs during a very sensitive time in early development, and largely thought to be irreversible (Aronsson,72). While sexual imprinting has been advanced as an explanation for what causes fetishism, a great deal of imprinting takes place before sexual reward centers have been set up in the child's brain and draws heavily upon developmental experiences within the family unit (ibid., 73). It stands to reason that if a sex robot were to make such an impression, routine access to the robot would have to be in place.

Beyond the neurological, there are physical dangers to be wary of. Ryan Calo, law and emerging technology expert, says we should not trivialize the potential danger of physical threat that can be enacted upon the human body.

> People get hurt by robots *all the time*, and they're not having sex with them. It's a pretty intense human-machine interaction. So, I don't think we can downplay the prospect of actual physical harm. With respect to surgical robots... there are situations where patients are burned because of exposed wires...and then about every year, a person or two is killed by a robot in a workplace environment, according to the statistics from OSHA. - *Calo*

Alan Winfield, cognitive robotics researcher and robot ethicist, backs up Calo's point on robot safety in a debate on The Ethics of Sex Robots.

> I think we should be worried about the safety of sex machines...there's a very good reason that most of the robots in the world today are kept away from people. They're not safe. But, think sex robots and you need to think machinery. [It's] not a good combination: machinery, intimate contact. (IAI)

In addition to the physical danger of simply being around machinery because the majority of these robots connect to the internet, there is an added threat of the machinery being purposely directed to induce harm. RenderMan points out the risk of physical injury, even with the right protocols in place, if vulnerabilities can be exploited by bad actors with malicious intent. “One of my major concerns for security, would be purely mechanical. One could expect that these things would have an articulated jaw...and having that clamped down at an inappropriate time would be a problem," says RenderMan. Beyond a mechanical malfunction, RenderMan posits, "If they're just implementing software that says, 'Don't go past this level', and you find a bug or some way to send a command directly that says, ‘Go all the way to 11’” then real-world violence can be executed via a sex robot through code. This brings us to the next theme, that of security and protection.

4.3.4 Security as An Afterthought

Standing between users and those who would do harm is device security. Part of this topic discussion will cover a few examples of security risks related to sex robots. The purpose of this is to stress the importance of cybersecurity for sex robots, in both domestic and therapeutic environments.

Too often, security comes second when it comes to robotics. To begin with, robots can be extremely difficult to produce, and cybersecurity isn't a standard component of robotics engineering and education. Ryan Calo explains:

> Security is often an afterthought in robotics. The reason being is that *robots are so hard.* Just getting them to stand up straight and open a door, or whatever it is you're trying to get them to do, is hard. Robots are hard. So, the idea of having to turn this thing into a product, and then having to think about security, which is not one of the core areas of robotics study -it's not computer vision, it's not actuators- and having to bring in somebody after the fact and bolt on security, makes it harder. - *Calo*

As discussed in the Literature Review, this "security second" approach is all too common in the sex industry. RenderMan discovered that many sex device companies are unaware that, by pairing their products to the internet, they have graduated into software companies.

> 'You are now a cloud software provider because you are providing the platform for these these connections'...Talking to a couple of them it was like night and day, they realized,

> 'We got ourselves into the weeds pretty bad here. We genuinely didn't know what we didn't know', and just that realization was enough to get them to go back to the drawing board and in some cases, completely redesigned their product. - *RenderMan*

What we are left with, is a lineage of two areas that are known to be poorly secured- robotics and sex tech. The news doesn't get much better because the Internet of Things is just as poorly secured. "Internet of Things devices are terrible; absolutely horrible security," says RenderMan, "You get stuff being shoved off to servers in God knows where." This includes data like local WiFi networks, status of connected devices, and other "analytics" that may not necessarily be disclosed in the product's policy guide.

Deadly Data Breaches

Here RenderMan explains the implications of seemingly innocuous analytical data falling into the wrong hands:

> All this other tangential information, when you're logged in, what your email is, what IP you're coming from, how long you used [the device], who you were connected to, when you were using it, *individually* those pieces may seem innocent, but you put that all together... and you can make a fairly interesting dossier. - *RenderMan*

He further discusses how some current devices, made for long-distance interaction, log GPS coordinates as user data, and how that could be taken advantage of.

> If you're in a country that these sort of devices are not permitted or looked upon unfavorably -like, you're a male and you have a male robot- the local law enforcement and local government is not gonna like that. Here's a thing that could theoretically get somebody killed. - *RenderMan*

This is not hyperbole. In 2012, Amuda & Tijani researched the application of Islamic Law in respect to sex robots. They describe two categories of punishment applicable to sex robot acts: *hudud*, and *ta'zeer*. *Hudud* are punishments for crimes that are specifically outlined in the Quran and hence prescribed by Allah. Such punishments are immutable and absolute; they must be executed as they are the word of Allah. *Ta'zeer* are varying degrees of chastisement for offenses not prescribed or otherwise mentioned in the Quran or Sunnah and are open to interpretation of the court. While sex robots were, of course, non-existent in the time of the prophet, many acts with sex robots could still be interpreted as falling under *hudud*. For example, if adultery is sexual congress outside of the marriage union, then the punishment for adultery committed with a sex robot still applies. The following table indicates possible interpretations an Islamic court may find, according to the authors, regarding acts with sex robots:

Table 4. Punishments of Sex Acts with Robots, under Islamic Law

Act	Category	Punishment
Sex with robot while married	Adultery (*hudud*)	Stoning to death
Sex with robot of the same gender	Homosexuality (*hudud*)	Capital punishment
General robot sex	*ta'zeer*	Subject to court (may include death / lashes / fines)
Robot prostitute or concubine while unmarried	*ta'zeer*	Subject to court (may include lashes / fines)

Regarding robot sex in general, according to the authors, if a court were to find that sex with a robot was equivalent to bestiality, as it is non-human, then by analogy, that act would be seen as *hudud*, and the offender would be stoned to death, and the animal killed (Amuda & Tijani, 25). In this case, we can assume this would mean dismantling or otherwise destroying the robot. This table does not of course reflect the attitudes of *all* Muslim people, but it does convey the severity of very real possibilities a Muslim person might face, depending on their community. Especially if they are living in a nation under Sharia Law. [13].

Sex-related data breaches with life and death consequences are not relegated to hypotheticals in the Middle East. Following the Ashley Madison hack in 2015, the suicides of at least four men were reported to be directly connected to the data breach, a pastor, and a police chief in the United States, and two other individuals in Canada (Mosbergen; Hussain; Baraniuk). Countless other sextortion scams have resulted in similar circumstances, with less notoriety and public attention (Day; Kamal & Newman).

A person's image and data could be stored by a sex robot without ever owning one or being interested in them. In the UK television documentary film, *The Sex Robots are Coming*, Matt McMullen, head of Abyss Creations, American manufacturer of sex robots, shares his vision:

> She would be able to recognize her owner versus a stranger she's never met..
> Say you introduce her to new people, she can actually assign a name to that face, so next time that person is there she can see and recognize: 'Oh, that's Bob. Hi Bob, how have you been,?'
> She will be able to remember key things about Bob, like, 'How are your kids doing?' and 'How is work over at the construction site?'.
> Little key things, that I think, really create that illusion of intelligence.
>
> -The Sex Robots Are Coming, *Channel Four*, airdate: 30 Nov. 2017

If that data is scraped, and Construction Bob instead happens to be a local priest, Father Scott, having to explain one's image and details in a sex robot database, without context, would be uncomfortable to say the least.

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[13] This document was derived from a translation, as it appears English was not the native language of the authors. I am not an expert on Islamic perspective and attempted to be as respectful and accurate as possible in my interpretation. This table should serve as a listing of possible outcomes more than a definitive guide. See Ethical Considerations for more.

New Ecosystems

The reasons for prioritizing security multiply when in a healthcare setting. At the top of the list, there is concern for the patient's well-being. Amie Stepanovich, a privacy lawyer and cybersecurity specialist, cautions,

> Anything connected to the internet poses a security risk. It's just a natural consequence of being in an environment where third parties can gain access to the network that you're on... If you're using it for therapy or for rehabilitation, you could end up, if it's taken advantage of, to further traumatize the individual that you're meant to rehabilitate, which is particularly concerning and it's a reason that companies really need to be paying particular attention to security in this area. - *Stepanovich*

RenderMan echoes this and discusses how robot manufacturers supplying the medical field will also have to be trustworthy actors.

> If someone [is] using it for psychological reasons, what they say to that robot to work through grief, that is the same, in a lot of respects, as a conversation you have with a psychologist and needs to be protected the same way. Having a company suddenly processing all of this and deciding 'We need to go and look at all the data, what people are saying and doing to improve our product', that gets weird. - *RenderMan*

Poulssen et al, argue that as robots enter these fields, risk mitigation ought to fall on healthcare staff and manufacturers both, "as it is the human and not the machine which is responsible for ensuring the system's security and the user's safety." (Poulsen et al., 1) In their review of current AI and robotics policies, the authors found that developing trustworthy AI was often given the highest priority. Focusing efforts on AI design, risks overlooking staff responsibility, essentially shifting all the focus towards system design and away from human error and accountability (ibid., 4-5). Other researchers have come to the similar assessments. In reviewing European strategies on robotics and artificial intelligence, Dr. Guido Noto La Diega found an “excessive emphasis on ethics” that he believes is at the expense of developing quality security. He also noticed an incapacity to strike a balance between competing interests when necessary, leading Noto La Diega to conclude that “the current development of AI technologies does not enable the delegation of operation to robots” (Noto La Diega, 10).

People mishandling robots can also be a huge liability, no matter how well their systems are designed. Education and staff training on cybersecurity is just as vital to user safety as developing secure networks and hardware. For example, Poulsen et al. observed that password sharing was a common 'cultural practice' amongst healthcare staff. (Poulsen et al., 3). ‘Social engineering’ is a common tactic used by many hackers that requires little technical expertise to crack a system if the right person can be targeted and finessed into exposing vulnerabilities or providing access (Lubeck; Burrell). If sex robots are applied to a therapeutic network, then all the parts of the ecosystem need to be considered.

Hospitals and IoT networks have both been targets of cybersecurity attacks throughout the COVID-19 crisis. 2020 was a record setting year in cybercrime, with malware attacks in the billions, and over 300 million ransomware attacks (SonicWall). California-based medical hospital network Scripps Health was hit with a major ransomware attack that severely impacted facilities during the pandemic. The information systems of four hospitals, numerous clinics and outpatient surgery centers were all affected, causing locations to discharge patients en masse, critical surgeries to be rescheduled, and in some cases, vital signs to be recorded by hand due to the shutdown of telemetry systems (Sisson). Ransomware targeting IoT devices also increased during the pandemic, with more people working from home and less likely to have the same protections as in the office (Seals). Hackers took advantage of this, using IoT devices as back-channel proxies into corporate networks, amounting to a 109-percent increase of ransomware attacks in the United States alone (SonicWall). These figures emphasize concerns of incorporating new devices into healthcare networks.

Another dimension that needs to be considered is, how important it will be to empower the elderly, whether as receivers of care, or consumers. As discussed, there have been numerous suggestions that sex robots ought to be used with the elderly (Sharkey, et al.; Jecker; Fosch-Villaronga & Poulsen, 2020; etc). Whether or not that comes to fruition, the elderly demographic of the future are the very same baby boomers said to be driving the market for the current wave of sex robots (Street-Porter). Döring & Pösch recommend health professionals do their part to dismantle taboos surrounding sex devices in healthcare by talking to their patients about the benefits that sex technology provides. They write, “Health professionals can support their clients by addressing sex product use, thereby normalizing it so as to overcome possible shame and guilt”, suggesting they could help with how to select and operate sex devices (Döring & Pösch, 2018, e54). If the sex devices on offer are network-enabled, then these conversations should also include security awareness, since the elderly are particularly vulnerable to cyber-attacks, sextortion, and technology-related scams (Skiba, 2020b).

Senior citizens make for a perfect victim profile. They are less familiar with technology, they tend to be more trusting, and often have built up financial savings over their lifetime (FBI). In addition, elderly victims are less likely to report fraud either because they don’t want to jeopardize their independence by being labeled as incompetent, or simply don’t know how (ibid.). The elderly community is particularly susceptible to romance scams, as a significant portion are struggling for emotional and intimate connections; they might be divorced, or widowed, and seen friends around them pass on, causing them to cling to opportunities for connections and ignore red flags (Skiba, 2020a). If AI-enabled sex robots are providing romantic relationships to lonely seniors in the form of unfamiliar technology, and precautions have not been established, they could provide the perfect opportunity for manipulation and exploitation.

Ransomware as Kidnapping

We have seen that data breaches can be used as sextortion, and malware attacks causing huge financial losses to corporations and jeopardizing patients. There is a final form ransomware can take, that is unique to the sex robot. There are some who will consider sex robots as romantic partners. In this regard, disabling operational use of a robot, and holding it for ransom, could be tantamount to kidnapping.

For some users, the loss of a doll or robot is akin to death, and many feel a need to process and mourn that death like any other. Japanese sex doll manufacturer, Human Love Doll Factory, recently diversified into a funerary service, Dole Funeral Services, due to a growing need for this service from its clientele. The service plans include official funeral certificates, photos and videos of the ceremony, option for a eulogy to be read, and an officiant (Christian, 2020b). Similarly, Shin Takagi, controversial child sex doll manufacturer, revealed that dolls are often "sent back home" when they become too damaged or cease to be functional. He takes the responsibility of their disposal seriously and performs a ceremony for them after they are disassembled, with the same rites that would be carried out for a human (Morin). This practice isn't limited to sex dolls, bomb detonation robots are also given funeral services, by soldiers who consider the robots comrades that helped to keep them alive (Garber). Even Aibo pets are given funerals, by owners who consider them more than mere machines (Hsu). While some people may regard a denial of service or ransomware attack on their sex robot as an inconvenience, for those that equate the loss of their robot with the loss of a partner, then there is the possibility a temporary loss could be as emotionally traumatizing as a real kidnapping.

If this seems far-fetched and limited to very fringe groups, do not forget that making sex robots as compelling and alluring as possible is a top priority of manufacturers. In the keynote talk for the 2016 Conference of Love and Sex with Robots, David Levy said to the audience,

> Consider what most people want from a life-partner, a spouse. All of the following qualities and many more are likely to be achievable in software within a few decades - your robot will be: patient, kind, protective, loving, trusting, truthful, persevering, respectful, uncomplaining, complimentary, pleasant to talk to, and sharing your sense of humour. And the robots of the future will not be jealous, boastful, arrogant, rude, self- seeking or easily angered, unless of course you want them to be (Levy, 2016).

Researchers in HRI are going beyond simple personality factors that might make for a compelling dating profile, they are also embedding research from human psychology. In a 2018 article for the journal *Robotics*, Rebekah Rousi discusses different models of lust, passion, and uncontrollable sexual attraction in humans. The author includes research into what drives human infatuation, how to induce mental states that increase sexual attraction, and paradoxes associated with lust, such as attraction that goes against one's best interests and morals, and how lust decreases with familiarity. She then states,

> These discoveries related to lust, passion and sexual attraction are quite interesting from the perspective of sex robot design as perhaps... robot[s] may be programmed based on specific sex/gender characteristics and in doing so, respond in appropriate ways to the human sex partner... [and] their physical and expressive features are designed in a way that

> more readily and appropriately appeal to the sexual desires of people from various genders and sexualities. (Rousi, 5-6)

Though it may be startling, this approach to sex robots is nothing new. As early as 2012, John Sullins demonstrated how psychological factors in human attraction, such as the various types of love models and romantic prototypes, could be functionally duplicated and programmed in robotic technologies. (Sullins, 407). In "Robots, Love and Sex: The Ethics of Building a Love Machine", Sullins arrives at the conclusion (or warning) that

> One thing that should be abundantly clear is that affective robotics, as it appears today, works best by manipulating human psychology. It seems that humans have a number of evolved psychological weaknesses that can be leveraged to make a user accept simulated emotions as if they were genuine" (ibid., 407-408).

The full literature of human psychology, and motivations on love and attraction is all out there, waiting to be programmed into an irresistible form, complete with algorithmically dispersed freckles.

4.3.5 Law & Liability

Rape By Deception

Before we venture too far off into tangential territory, let us return to the pragmatic. When we are discussing crimes that can be committed using sex robots, it may sound like a science-fiction future, but as Stepanovich points out, these are crimes we already have names for

> I think we'll see new *applications* of crimes; I don't think we'll see new crime. We know what rape is and we might see it committed in different ways... We already have the tools in the toolkit to go after the bad activity that we need to be going after and we should be using those tools. - *Stepanovich*

As RenderMan points out, the laws that define these crimes need to be upheld in more jurisdictions.

> Law enforcement needs to catch up. There are jurisdictions, all over the place where there is no requirement for whether a rape charge requires either physical penetration or physical presence. They don't have any concept on the books of remote sexual assault. Also, some jurisdictions don't even have anything for rape by deception. - *RenderMan*

Rape by deception has likely existed so long as there have been twins. But sex robots and other new sex technologies like virtual reality and haptic devices, take the possibilities for rape by deception into whole a new territory- the virtual.

Robert Sparrow is a roboticist who has written multiple papers exploring sex robots and forms virtual abuse. In "Teledildonics and Rape by Deception", he and author Lauren Karas discuss how future iterations of internet-connected sex devices can be used to perpetrate sexual assault. They outline 10 different acts, ranging from invasion of privacy to rape by deception, that could be considered criminal, if not immoral. This list includes forms of 'Unintended Intercourse', whereby someone believes they are interacting with a program, that has been interrupted by a hacker, whom they are now engaging with, and 'Dildo Deception', whereby someone masturbating with a teledildonic device is unknowingly broadcasting to an online audience (Sparrow & Karas, 32; 42). The difficulties with policing such acts are plentiful. Firstly, often the victim might be initially unaware that a violation has occurred, as with the Dildo Deception example. Secondly, the victim may have willingly consented to a sex act, but a perpetrator has knowingly deceived the victim on the circumstances, or of the perpetrator's participation. These different elements conspire to create a situation where we are faced with a lack of strong security protocols and practices on the industry side, in tandem with a lack of jurisdiction to prosecute crimes, that are particularly difficult to detect. Luckily, the technology is still nascent, and there is time to get things right. Stepanovich urges,

> We need to be taking it very seriously and having a conversation about whether current laws that we have on the books for rape encompass that type of activity. In some states they do, and in some states they don't. We need to rewrite them so we can anticipate what we need before it happens, so we don't have to react after the fact. - *Stepanovich*

Coverage by association

Calo is optimistic and believes that as society's needs advance, progression of laws in other arenas, such as liability laws will likely expand to cover sex robots.

> My anticipation is, just as the technology evolves over the next quarter century so will social mores, and so will the law itself and legal institutions. I nevertheless think that there will be some basic core values we'll be trying to preserve, things like physical safety.- *Calo*

Currently, there are conventional physical risks (i.e., chemical hazards, risks for injury) associated with sex devices that has led to appeals for regulation in sex toy labeling, design, and testing. Existing regulations for sex devices in the United States fall under the jurisdictions of the Consumer Product Safety Commission (CPSC) and the Food and Drug Administration (FDA). The CPSC oversees sex toy sales but does not mandate or implement any labeling standards for testing, and the FDA only has regulatory control over the small number of vibrators classified as obstetrician and gynecological medical devices. The remainder of sex devices, constituting the market's vast majority, are currently sold under the label "for novelty use only" which exempts them from regulation on mandatory safety testing- a situation which has not gone unnoticed. In an opinion piece for *Fronteirs in Artificial Intelligence*, Galaitsi et al., highlight "The unmet safety needs for sex toys may offer useful insight in navigating the complex landscape of risks represented with sex robots." They go on to discuss that as sex toys and sex robots become internet-enabled, the risks expand beyond that of the conventional and into the cyber realm. The authors worry that these risks, such as capturing video, storing user information, and remote operation "cannot be fully addressed under existing regulatory processes for other products" (Galaitsi et al., 2-3).

This is where governance is most likely to play a role. Many are skeptical that sex robots will be treated with seriousness, and therefore evade consideration for regulation. Prof. Alan Winfield says, “As someone who works on standards, I think the likelihood that the British Standards Institute publishes a standard on the specification and safety certification of sex robots is pretty slim" (IAI). However, as mentioned previously, sex robots could full under the definition of ‘smart robot’ according to the EU Civil Laws on Robotics, without being mentioned by name. Calo notes that while regulatory bodies may not be specifically concerned with sex robots or sex devices, they are becoming increasingly aware of the importance of data protection.

> [I]f the robot is capturing your voice, capturing other kinds of biometric information, heart rate, pupil dilation... it's highly sensitive information, and I would expect that in twenty-five years, a lot of jurisdictions in the United States and abroad would catch up. For example, Illinois has the Biometrics Act[14], or the proposed EU regulations which include biometric safeguards and biometric information[15]. - *Calo*

If these types of biometric data become closely guarded, then any device that interacts with, detects, and stores such information will then likely fall under new umbrellas of regulation and scrutiny.

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[14] The Illinois Biometric Information Privacy Act, or BIPA, was introduced in March of 2020. The act regulates how companies collect, store, use and share biometric data and information. Here “biometric information” is defined as metrics that can be used to identify an individual, including retinal scans, iris scans, hand & fingerprints, voice prints, and face geometry (ILGA). In August of that same year, a similar bill was introduced to Congress under the National Biometric Information Privacy Act of 2020 (US Congress, 2020).

[15] See: Wiewiórowski; EDPB-EDPS.

The sex tech industry could stand to learn a lot from other industries, especially if sex robots become categorized as medical devices. RenderMan shares an anecdote with a sex device manufacturer that had moved in from medical devices and wearables into sex tech. The company made a Kegel exerciser that was originally developed to treat incontinence by training the pelvic floor, and then began marketing it as an adult consumer product. Coming from the perspective of a medical background is likely the reason the company took privacy and security seriously and developed their app accordingly. RenderMan shares that he was pleasantly surprised to find that the web server for their API included documentation and user information was anonymized to reference numbers. Recalling this case he says, "We need to build those bridges between sex tech and other technology ". Stepanovich says how we get the ball rolling is,

> We start with just open, honest communication, then we take our learnings and the things that we know from other industries, and start transferring that information into this area, also looking at what laws are currently on the books and making sure that those are going to apply where we need them. - *Stepanovich*

This moves us into the last theme, which has to do with dialogue, empowerment, and education across all groups- from consumers to manufacturers, researchers to politicians.

4.3.6 Crucial Conversations

Empowering consumers

In January of 2021, reportage of a ransomware attack on a male BDSM teledildonic device appeared in several media outlets. The device was an app-controlled chastity belt with a flawed API (Application Programming Interface). Hackers had taken advantage of the flaw and succeeded in remotely locking the device -which did not feature a physical override- and sending users extortion messages demanding Bitcoin as ransom. It is well documented that the product manufacturer had been warned about this flaw months in advance (Lomas). Reporting on the matter was tongue-in-cheek with headlines and phrases such as "Willy let me out?", "Men, look away now" and "Is this story too grim for a Wednesday morning?" appearing in articles reporting the hack. It's easy to make light of these types of incidents, but rather than poking fun, we should be empowering consumers.

> [P]eople like to say it's their fault they're using them to begin with and I don't think that's the right approach to take... Victim blaming, that doesn't really get us anywhere... We don't need to be shaming them for doing so, we do need to be providing them with the information, taking the precautions, adding the security measures, and making sure that we have it all in place. Giving them the information they need to make real, thoughtful, informed decisions. - *Stepanovich*

RenderMan's website, The Internet of Dongs Project[16], provides this kind of consumer empowerment and holds sex toy manufacturers to task. The Internet of Dongs reviews sex tech devices for security vulnerabilities and often engages with manufacturers to make them aware of flaws. The site teaches consumers how to recognize indicators of security awareness from manufacturers and includes a list of questions for consumers to ask themselves before purchasing internet-enabled sex devices. The website also has a trusted vendor list of sex toy companies that meet their standards of security and submit to their Vendor Code of Conduct. This works to benefit both the consumer and vendors. Consumers are given information on trusted companies, and vendors can market themselves as such.

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[16] https://internetofdon.gs

Internet-connected sex tech devices ought to be held to the same standards as all IoT devices since they are essentially one and the same. As Stepanovich highlights, "Everything needs security, whether it's a sex toy or a coffee maker." RenderMan also enforces this point,

> We already have standards out there for it. People need to realize the connected vibrator that you have is no different from a connected thermostat, or toaster, or doorbell. The same principles apply... you open them up, it's the same chipset and design. Getting people to realize that, and make conscious decisions when they're buying, saying, 'Does this company care about security more than just saying "We care about the privacy and security of our customers"? Do they have a vulnerability disclosure policy? Do you have a way to reach them to say there might be a problem here?' - *RenderMan*

These questions are reflected in the IoT consumer guide, **Privacy Not Included*, developed by Mozilla. The guide shares the following standards for internet-connected devices to be considered secure:

- encryption for communication
- consistent security updates
- a clear and accessible privacy policy
- strong password requirements
- a way for the company to manage security vulnerabilities in its products

Unfortunately, many sex tech products and IoT devices are failing to meet these criteria, which are considered the *minimum* requirements for product security.

Informed customers can use their purchasing power to affect the market and demand better security. With such a high price point, the sex robot user base can afford to be discerning. If consumers routinely hold sex tech and IoT companies accountable to these standards, RenderMan believes that ultimately,

> The industry will develop this, but I think they need to come together and have some very set guardrails for how they do things. Realizing [that] 'We're not going to be able to data

> mine this… We need to make it so that it's all on-board... We need to be privacy respecting, or people aren't going to buy these things.' - *RenderMan*

Public opinion moves much faster than policy and might be the quickest way to institute change that serves the public's best interests. Possibly the only way. As RenderMan cautions,

> Government agencies, NGOs, manufacturers, -stakeholders- they're all going to have competing interests from the consumer.... Government is going to generally want to be reelected, so they're going to go with the social mores of their time.... The manufacturers will want to profit if they can find new and interesting ways to do so. - *RenderMan*

The tech in sex tech

As for the industry itself, many were unanimous in their assessment that those in the sex tech industry need to begin regarding themselves as *tech* companies, first and foremost. People looking in from the outside should take the precarity of cybersecurity within the sex tech industry, as an opportunity. RenderMan says the nature of the product is preventing people from seeing the potential. "We need to get over some of that, or at least set up some very good guardrails within the InfoSec industry and realize there's money to be made here because the security sucks," he says. Stepanovich suggests that the sex tech industry and IoT could both benefit from bug bounty programs as well.

> What we can be doing is opening conversations with the tech industry themselves, to talk about standards, and bug bounty programs. All of these conversations that have been started... over a decade, with other industries; all those conversations now need to make their way into the sex tech industry, and they can't do that if we're shying away from those conversations or treating it like a taboo field. - *Stepanovich*

Bug bounty programs are a method of vulnerability testing that is open to the public, and offers rewards for revealing security flaws, a crowd-sourced penetration test, that is often used in information security.

> I'd like to get them to the point where they have a standard, like a trade association kind of thing to hold each other to, and make sure that they are actually doing best practices. They're making mistakes, now, that we figured out 20 years ago, but because they are sex they are marginalized. - *RenderMan*

Calo recommends that the sex tech industry take their cue from other industries that have fared regulation pretty well, by self-initiating standards.

> With video games, I think that the industry really sidestepped a confrontation in many ways, by winning a couple First Amendment cases but also by imposing upon themselves, learning requirements and grading maturity ratings… I would also fully expect that you could imagine a world in which robots that were heavily anthropomorphic and designed to interact with people, may similarly come with a self-imposed industry rubric to give you a sense of how mature you need to be to interact with these things. - *Calo*

This would also be serving the sex tech industry's best interest since the alternative would be inviting the government in to regulate, who again, have competing interests from the manufacturers. As RenderMan puts it, "If the industry doesn't get its act together, then regulators come in and that never ends well. Particularly anything associated with sex."

Creating governance through engagement

Finally, when it comes to governance, the participants agree that it is going to take substantial dialogue with multiple stakeholders and actors. This connects back to many of the elements previously discussed.

> This is one of those areas where you don't hear lawmakers talk about it in a lot of places, the US in particular. It's very taboo, they don't want to bring it up. And if you bring it up to them, frequently you'll see them shy away from this area, because of the risks. – *Stepanovich*
>
> You need to get stakeholders -consumers, manufacturers, regulators- and come to some agreement to allow the technology to advance with some oversight... Otherwise, you're going to get the 86-year-old lawmaker in there regulating it to death - *RenderMan*

This is also reflected in the literature, in an editorial for the *British Medical Journal* discussing the health implications of the sex robot industry, titled *I, Sex Robot*, Cox-George & Bewley assert,

> Third-party interests, witnesses and bystander effects have to be considered as sexbots enter the public domain. Greater tolerance of sexbots relies on society having an informed and agreed view of a laissez-faire governmental approach, rather than one regulating financial exchanges related to sexual activity. (Cox-George & Bewley, 162)

In fact, many have been urging the need for stakeholders to come together and create a discourse that can guide further action, policy, and regulation. Brandon, in 2019, said,

> What some people suggest is that governments have a panel to provide some guidance along these lines so they might have consumers as part of the panel: AI folks, lawyers, etc., to give their best guidance as to how to proceed. (Brandon, 2019)

Overcoming the Taboo

As discussed, however we may see the "typical sex robot owner", we should not be judging them for their reasons. Not only would a culture of shame prevent someone from using a sex robot that might receive benefit from one, it prevents real work from getting done, in research, policy, and security. Galaitsi et al., insist, "Regulators need to place this topic in the light and examine it with the same professional dispassionate objectivity that is granted to other consumer products" (Galaitsi et al., 3). RenderMan elaborates on how the taboo surrounding sex causes difficulties in some work environments,

> When we get into sex related stuff or sex adjacent, it becomes a major HR nightmare, 'Are we making employees uncomfortable by this because potentially somebody would have to have an adult website on their screen in the office?' We have made it purely optional work on those projects, but some people have trouble saying no to a boss, or to an assignment, or a task. - *RenderMan*

Oliver Bendel brings up a similar problem within academia, where the sexual taboo is a hinderance to self-starting serious academic inquiry and research.

> The presence of a love doll or a sex robot could cause scientists to feel awkward. Whether empirical research may go so far as to allow test subjects to gain experience with dolls is unclear. Certainly, for student subjects this would be condemned and prevented at some universities, even at universities of applied science. (Bendel, 2021, 9)

There is dire need for more research. Looking at three literature analyses of sex robot studies conducted in 2020 and 2021 from multiple fields, all three papers concluded more empirical research is needed (Mainenti; Döring et al., 2020; Gonzalez-Gonzalez et al.,). The same is found over and over in individual papers (Bendel, 2021; Fosch-Villaronga & Poulsen 2020; Peeters & Haselager; Cox-George & Bewley). Granted, as Bendel points out, there is a reasonable limit to what type of research can be done.

> Empirical research is possible but has its limits. For example, it would be irresponsible to increase desire in a subject… which then unleashes itself in real life. Other methods such as surveys, are unproblematic and in some cases effective. (Bendel, 2021, 8)

In absence of empirical and observational studies, other methodologies such as those used within Futures Studies can lend themselves to furthering research in this field in an ethical and open manner. I hope I have accomplished that here today.

4.4 Interim Summary of Findings

- Positive reception towards Sex Robots is significantly higher when framed as a component of healthcare, physical therapy, and wellness.
- User customization is critical to the success of the Sex Robot product. Even users of the same cohort are likely express different needs and design preferences.
- Exposure to Sex Robots can have physical consequences on users via supernormal stimuli and sexual imprinting that can influence behaviors over time, possibly causing intimacy issues and shaping romantic preferences.
- Sex Robots can be exploited through cyber-attacks and data breaches, which can detrimentally impact both individual users and larger systems they may be placed within.
- When it comes to security of Sex Robots, it is not enough to trust product design alone. Actors at all levels need to be considered.
- Sex Robots are more likely to be regulated efficiently if they fall under new product categories (such as biomedical devices, smart robots, etc.).
- Sex Robot users can directly effect change within the industry though their purchasing power. To this end, consumers and society should be better educated on the importance of security in sex and IoT devices.
- Law enforcement needs to catch up when it comes to being able to recognize and prosecute new forms of sexual assault that are perpetrated through technology.
- Cybersecurity in sex tech, IoT, and robotics is precarious. There are glaring gaps industrywide, and thus opportunities for privacy and security roles, especially in sex robot and sex device manufacturing.
- Taboos surrounding Sex Robots, and sex in general, prevent real work and research from getting done.

4.5 Factors

The following elaborates on the findings of the thematic analysis and identifies prevailing factors which can be applied to the scenarios. These factors, or drivers of change, are those that will have the largest impact on the future of sex robot technology, with respect to the themes. With these factors established, a value can be assigned (such as increasing or decreasing, negative or positive). This range of activity is referred to as the *behavior* of the factor (Fergnani, 2020). Once the factors and behaviors are determined, they are placed within the context of the predetermined archetypal narratives to form scenarios.

These themes are so interrelated and connected that it becomes difficult to separate them. For instance, the male orientation of the market is heavily influenced by society's sexual attitudes. These attitudes also influence our willingness to have open discussion, which goes back to "overcoming the taboo". As such, adjusting the behavior of one factor will likely have a large influence on multiple themes. The purpose of identifying these factors is to negotiate future pathways to change, with the themes in mind.

4.5.1 Design Proliferation

When re-examining the first theme of male fixation, we are confronted with the tendency of the sex robot market to be oriented exclusively to male consumers, and the perpetuation of patriarchal attitudes as a by-product. This can be reinterpreted as a factor with the opportunity to be deeply effective. That factor would be design. If a male-dominated design ethos is currently giving rise to negative gender stereotypes, it stands to reason that a proliferation of multiple design ethos, be they feminine, humanistic or whatever, would shift robot design to produce more gender neutralizing outcomes. There are trends to indicate that such a shift is on the horizon.

Kate Devlin, author of “Turned On: Science, Sex, and Robots”, points out that within sex toy manufacturing, there has been a trend towards abstraction in design. Usually attributed to more females entering the design side of sex toy production, sex toys have gone from crude representations to colorful, smooth, dynamic forms that would go unnoticed on an office bookshelf (Devlin). "We have the potential of new forms of interaction that's unlimited by physical realism. We're seeing sex toys that are breaking new boundaries; they've become beautiful, customizable, programmable," she told the audience at a 2017 Ted-x talk in Warwick (ibid.). Author Tanja Kubes has also noted this trend, and insists that from a queer perspective, intervening in the sex robot design process is a critical opportunity for the feminist community to challenge heteronormative ideology and reclaim agency in human-machine relationships (Kubes, 2019a). In addition, Bendel has predicted that as more designers from different arenas approach sex robots, we are likely to see sex robots that not only look real but represent real body-types. He writes, “Of course, commercial providers will be guided by the (possibly highly diverse) wishes of their customers, and science and art will be interested in the deviant, the unusual, and not just satisfy their own needs. So, at the end, the resultant variety could lead to a model that more closely resembles reality” (Bendel, 2021, 9).

4.5.2 Sexual Attitudes

The next factor we can consider is social attitudes about sexual needs. Will a person’s sexual needs be viewed as their transient urges for momentary release, or a vital element of their overall well-being? For the sake of this exercise, the behavior of this factor will be labeled with positive and negative values to represent opposite ends of a spectrum. Attitudes at the negative end of the spectrum equate sexual needs with immediate sexual gratification, and sex robots as a means to an end. Di Nucci posits that “the very idea of ‘fulfillment of sexual needs’ might be a patriarchal oppressive idea' (Di Nucci, 2021). This best captures the attitudes at the negative end of the spectrum, where one's sexual needs are temporary urges, and the right to fulfill those urges comes at the expense of others. The flip-side of this would view sexual needs as an expression of deficits in equilibrium, and the maintenance of sexual health is a holistic process. Those at the positive end of the spectrum view balancing on-going sexual needs as a component of maintaining sexual health. In this light, sex robots are used as a tool for self-care. Using sexual attitudes as a factor, we will be able to see what governance looks like within a society with positive sexual attitudes and without, or how design proliferation is affected when sexual attitudes remain unchanged. Whether users will be treated with dignity and respect, whether designing policies will be considered of social importance, etc., will reflect these attitudes.

4.5.3 Regulation

This last factor takes regulation into account, whether it is self-initiated by the sex tech industry, as many participants had suggested, or whether it takes the form of government regulation and top-down ordinance. This will be influenced by many of the elements discussed in the thematic analysis, such as whether consumers are empowered enough to hold the industry accountable, and what types of conversations take place in the coming years. The behavior will be examined in the following way: two scenarios where the industry is self-regulated, and two scenarios where the government imposes controls (see: Fig. 5).

As far as the other themes are concerned, these three factors will directly impact the other elements discussed in the analysis. For example, group vulnerability was discussed, however over time, these groups would not become more or become less vulnerable[17], so 'vulnerability' would not be considered a factor by itself. How the needs of these vulnerable groups will be considered and addressed will be reflected in society's attitudes and designs they produce. Similarly, the other themes are encompassed within the interaction of the factor behaviors. Security, law, and policy will manifest as result of regulation, which are informed by social mores and sexual attitudes. Conversations will take place as attitudes change. Whether the industry has incentive to regulate will come as a result of consumer empowerment, or lack thereof.

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[17] That is, vulnerability as a consequence of physical conditions will not change. More elderly or less disabled people entering into the population would not make them any more vulnerable or worthy of consideration.

The graphic in Figure 4 shows the Four Archetypes placed along a double-driver axis. The upper-half of the matrix represents high design proliferation, and scenarios on the right-side have positive sexual attitudes. *Transformation* in the top-right features both of these attributes, whereas *Collapse*, in the bottom-left represents neither. The rectangle shapes are added to help with visualization. In Figure 5 the factor of regulation is framed within each scenario, where *Transformation* and *Continued Growth* see the sex tech industry self-regulate, and governance take control in the *Collapse* and *Discipline* scenarios.

Figure 4: High Design Proliferation and Positive Sexual Attitudes represented on a Double Driver Matrix

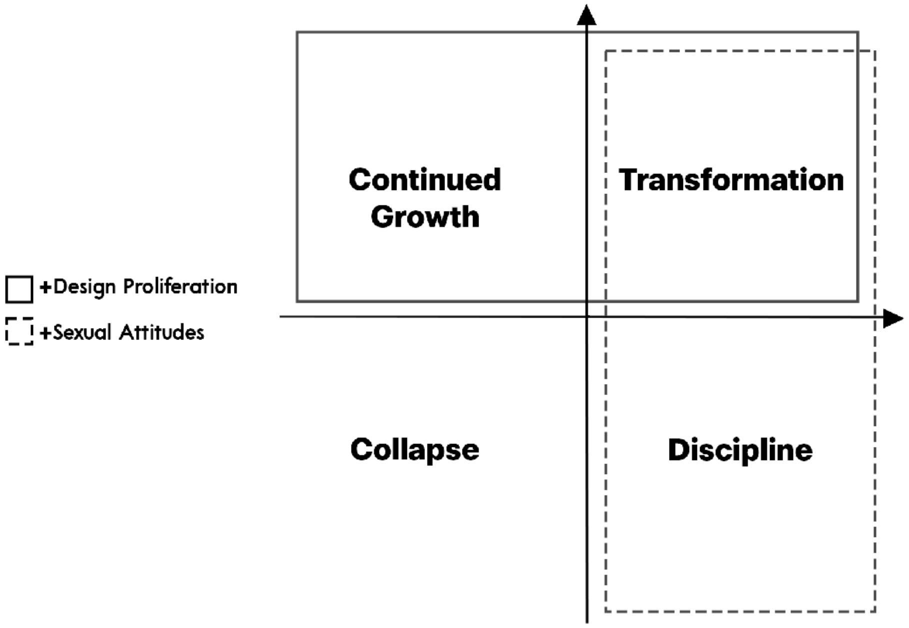
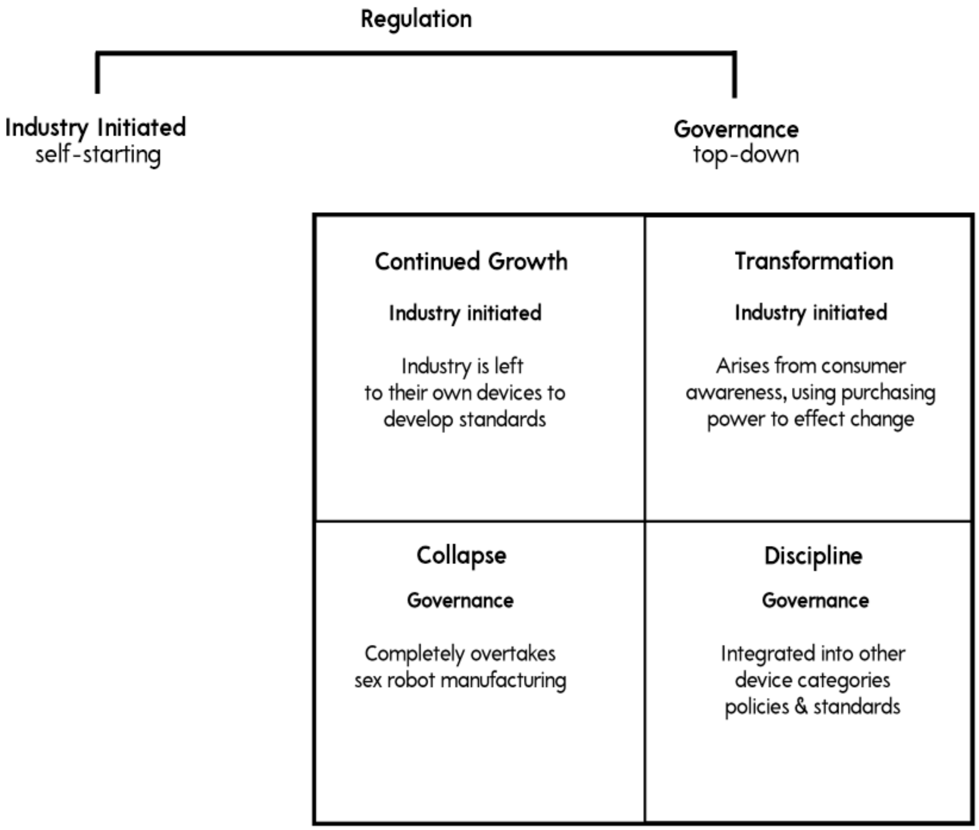


Fig. 4

Figure 5: Different Behaviors of Regulation as a Driver of Change



Continued Growth **Industry initiated** Industry is left to their own devices to develop standards	**Transformation** **Industry initiated** Arises from consumer awareness, using purchasing power to effect change
Collapse **Governance** Completely overtakes sex robot manufacturing	**Discipline** **Governance** Integrated into other device categories policies & standards

Fig. 5

Chapter 5. Scenarios

Introduction

Time frame: 25 years

Location: United States

The following scenarios unfold 25 years in the future and take place within the United States. The year is 2046. The time frame of 25 years was chosen because it is considered enough time for a societal transformation to come about (Fergani & Jackson, 7). Two-and-a-half decades of developments in the field of robotics, AI, and material technologies is far enough to make for exciting advancements in quality, and the lowering of costs that typically diversifies access, but not so far ahead that one would be inclined to make grand, science-fiction type predictions. The location was chosen simply because the majority of the interview participants and survey respondents were from the United States.

5.1 Continued Growth Scenario - Robot Sex $ells

While sex robots aren't extremely common in private homes, they have found their way into several industries. Rather than integrating into formal healthcare practices, they are usually purchased for private use and then reimbursed by insurance companies, if a significant case can be made by the claimant. Reimbursements are usually given to the elderly, people with disabilities, and those with a referral from a licensed psychosexual therapist. Psycho-sexual services are almost entirely within the domain of private insurance companies, and not typically covered by state Medicare/Medicaid programs (with the exception of Oregon). In European nations, there are several care programs through the EPSEAS network, that help distribute sex robots to disabled people and offer free education courses to assistant care workers on their use and maintenance.

Sex robots are often brought into socially isolated workplaces that typically employ a male majority. Sex robots are combined with VR, AR, and haptic features so those who are in relationships can maintain sexual contact with their partner while on deployment. Oil rig workers, soldiers, even scientists in the Antarctic research facility can share avatar experiences with their spouses. Often, custom molds of their partners are cast and ordered in advance of departure. Military wives working from home have become so good at maneuvering this technology, a new line of sex work was inadvertently started. Like the 1-900 sex line phone operators of yore, men and women working at home can be avatar operators, with minimal start-up costs and barriers to entry. With haptic and VR technology, having a robot isn't necessary to operate one, so long as the robot on the client's side features Remote Avatar (RA) capability. Remote Avatar technology is standard fare for long distance relationships.

Robotic and VR experiences for long distance partners are often hacked and leaked online. The technology has the capability to record the sexual experience from both partner's point-of-view (POV). Anyone accessing this recording can choose to witness the experience of Partner A and can even choose to load the movements of Partner B into their robot, and vice-versa, if they happen to have one. Surreptitiously obtained POV recordings have become a niche area of pornography, to the degree that it is often spoofed by amateur and professional pornographers. Other markets sell what they claim are authentic sex simulations with your favorite celebrity, based on their RA user data, but are mostly known to be fake (other lines of pornography feature deepfaked celebrity faces on nude bodies). For some charity benefits, celebrities -usually reality television stars- will sell a one-time use sexual experience as an NFT. Porn stars do this regularly.

Some United States prisons even began offering Remote Avatar Sex Robots as an alternative to conjugal visits, eventually replacing conjugal visits entirely. At first, this was widely protested, citing the lack of human touch was stripping away the inmate's dignity and mental well-being, like call-in visitations or teleconference court. But, like any other contracted service to the United States prison system, there was huge profit to be made in leasing the equipment and supplying the service. RA services and equipment costs ten times more than typical consumer models and are not nearly as sophisticated. The sole company contracted to provide conjugal services to the United States Federal Bureau of Prisons and State Department of Corrections says that their proprietary software ensures the safety of the inmates and their partners. Rather than allowing the inmate's partner to use their own equipment and load in from the privacy of their own home, they are still required to come to the correctional facility and use the equipment provided there. Inmates without partners are also allowed to use sex robots, provided they exhibit good behavior for a certain time period and meet other standards which vary state to state.

In the United States, most people's experience with sex robots are from bachelor and bachelorette parties. Sex robots are a common trope at these celebrations and usually rented to perform as strippers. Party entertainment robot services have sprung up nationwide and provide perfectly tailored robots with added functionality like making cocktails and performing karaoke.

There are also sex robot "lounges" in most major cities. These lounges are housed in nondescript buildings and offer 100% discreet experiences. These lounges employ effects artists, coders, and staff that sign NDA contracts regarding all aspects of their employment. Lounges are typically members-only clubs, with robots that come in all shapes and sizes, that can be programmed to satisfy any fantasy and don't connect to the internet. Some lounges feature Faraday-cage style rooms, promising perfectly sealed security for any potential act.

Many say that American robot lounges are nothing compared to their counterparts in Japan. These lounges are modeled after the country’s infamous host/hostess bars. In fact, these “e-host” bars are nearly identical to the original environment of host bars and staffed with robots “happy” to chat with a lonely businessperson, for an established rate. These bars double as robot model showrooms, as most clients will purchase one after a few interactions with the same robot. Many suspect the popularity and success of host robots is due to the fact that their conversation skills were learned from digesting hours and hours of recorded conversations of client-host/hostess interactions.

Sex robot addiction has been on the rise world-wide, and even has its own sub-chapter within Narcotics Anonymous. Sex robot addicts tend to spend all their time with robots to the detriment of academic, career, and family responsibilities. There are even a few people who claim to identify as robots, saying they never felt human in their own bodies. Though these cases are few and far between, they do tend to grab a lot of media attention.

There has been mixed success with sex robots and the elderly population. At first, adult children of senior citizens were quite happy to leave their elderly parents with a robot that could address their "discreet needs" while also being present in case of an emergency. Sex robots specifically designed to interact with the elderly can maneuver themselves to lift someone who has fallen and alert emergency services if necessary. These robots are marketed heavily on this feature: *Buy your parent a partner, and your whole family piece of mind…*

However, the nation was soon horrified to discover that the elderly were being targeted into robot romance scams. Typically, the scam is initiated when the victim meets someone through social media that encourages them to grant the scammer access to their robot’s Remote Avatar feature. This is a typical step taken in online relationships. Working from a script, the predators have their victims sharing credit card information, signing up for new accounts, and in some cases, transferring their life savings into untraceable crypto wallets, all within a few months of initial contact. People tend to be more concerned with their dwindling inheritances or having to move mom in once her savings were depleted, rather than the stark reality that these robots were likely inhabited during intimate acts with their parents.

After some trial and error, care models were released with limited RA functions. After all, disabled people were also purchasing these models, that were perfectly sound of mind, and very much wanted to use the Remote Avatar feature with their partners (or strangers on the internet). Even with this function disabled, the elderly are still being preyed upon, since they are more likely to leave their robot running all day. This could be so they have someone to talk to or to actively scan for an evolving emergency. This suits the robot service provider's affiliate partners quite well, who can collect ample consumer behavior data to exploit. After learning their owner’s habits, robots can be quick to remind them that they are out of Earth brand paper towels, or casually recommend one meal kit subscription service over another. This practice is known as SCC, or Sponsored Content Conversation. Annual or monthly AI subscription fees are often waived if the user agrees to activating SCC.

In the same way human behavior and psychology was mined to make marketing strategies increasingly more effective, advertisers and marketing firms have turned toward the field of HRI, to find ways that make their AI mascots more appealing. Catering to different attachment types, some characters are so compelling, so seductive, as to be nearly irresistible to their target demographic.

Continued Growth Common User

Sometimes Alex uses her sex robot for on-screen performances she broadcasts on her SiiMii site, a social media platform that allows users to sell sexually explicit photos, videos and experiences to their fanbase, or grant them unlimited access based on a subscription. Whether her robot is set up as male, female or in-between is usually based on the poll results of the day’s fan requests. However, live performances are becoming less common for Alex these days. Not only are they exhausting, it seems every hour of the day is competitive for live streamers and what is necessary to "up the ante" is pushing the limits of her comfort zone. Instead, using a plug-in, she likes to record herself in private and sell experiences to her fans. They can download a file set and see what it's like to spend a night or share a shower with her. It's a great way to earn passive income while she pursues her nursing degree... though she tries not to think about the long-term consequences, or what would happen if her parents found out.

Honestly, if she didn't have student loans to pay off, there's no way she would have bought a robot. Her model is the standard of SiiMii stars- modularly gender fluid with a half dozen cameras to catch multiple angles and sensors of all sorts for recording experiences. Her main gripe is that it takes up decent real estate in her closet. She used to leave it in her bed like a pile of unfolded laundry, but she could never get used to the experience of waking up next to it. Leaving it leaning against a wall was even more disorienting, especially in the middle of the night.

5.2 Discipline Scenario - Robo-Bureau-cratic

The early part of the millennium saw society fumbling its way through the internet and cybersecurity. As digital natives became older, fully embracing the technology that always surrounded them, it became obvious that security education was important for their own children. OPB, or Online Privacy and Behavior Education is a common part of public-school curriculum in the United States and considered mandatory education, on par with sex education programs. These programs include media literacy, recognizing fake news, and deep fakes, protecting yourself and your online identity. This change in digital awareness has become common sense, like hygiene and nutrition.

While ownership of sex robots isn't the norm, they are accepted as a form of social care. As sex robots were successfully used in physical and psychosexual therapy, sexual care clinics began popping up all over the country. These clinics are set up halfway between a brothel and dentist office, where rows of private rooms line the hall, featuring a couch, bed, or reclining chair inside. Their integration into American society was similar to the path of legal marijuana dispensaries. For instance, the rooms started out quite stark, like early marijuana dispensaries that wanted to lean on their medicinal purpose. Now they are more relaxed, with environmental overlays that can be projected over the room through dynamic lighting displays. The success of sex robot clinics has caused the healthcare industry to be the largest customer of sex robots. As a result, sex robots, like other high functioning robots that interact in a biomedical space, are registered to a national system, assuring they comply with the latest operating system updates and security patches.

Sex robot clinics are utilized by sex therapists who send patients with program recommendations, much like a prescription. Therapists, psychologists, and programmers began working together to address various issues from erectile dysfunction to sexual trauma. While each patient’s treatment program is bespoke, they do draw from common elements, oftentimes involving a surprising amount of talk therapy from the robot’s end. Other patients come on a physical therapist recommendation, for a variation in muscle strengthening and endurance exercises that have become too routine. People with disabilities usually apply through their healthcare provider for something like membership passes, so they don't need to contact their physical therapist every time the urge comes up.

At first, sex care clinics were pretty jaw-dropping, like the heroin clinics in Amsterdam, but once their newsworthiness wore off, and people saw their effectiveness, they quietly integrated into their surrounding office buildings and medical plazas. In some states, these clinics can allow members to join for recreational, or non-medical purposes. In these states, people tend to prefer sex care clinics to prostitutes, especially if it is going to be their first time; for the same reason people prefer marijuana dispensaries to pot dealers: it's legal. Of course, prostitution continues, because there are still men willing to pay for prostitution to exist.

Bizarrely, one man had fallen in love with his go-to robot at the clinic a few years ago and demanded to buy them “out of slavery”. He couldn't wait to see them between appointments and couldn't stand the thought of them sleeping with other men and women. The story was hailed as a “Pretty Woman for the 21st Century” in media headlines and memes. For this reason, the level of sophistication in clincal robot’s personalities was dialed back, unless specified to work with a therapist-designed program.

Since sex robots are mostly relegated to clinics, there isn't much proliferation in aesthetic design. As a result, a cartoonish hypersexual body-type prevails, catering mostly to men. As predicted by other exemplars in current history, the sex robot technology has become a strange female beauty standard. In the past, women had walked into cosmetic surgery consultations wanting "porn star lips", or to look more like their go-to AR filter. Now, it's not uncommon for a plastic surgeon to be shown a picture of a particular sex robot, curiously the most commonly coveted feature are noses. Some cosmetic companies promise their foundation delivers that "perfect Smart-Skin blur". For decades, it had been the goal to get robots to look more human, now humans are aspiring to look more like robots. Imitation is a strange form of flattery, and for robot designers, it feels like validation.

Sex robots are part of the social lexicon. As much as "working like a slave", and "working like a robot" have their own connotations, "working like a sexbot" has its own particular evocation.

Usually, the phrase refers to one who works cheerfully and tirelessly, with an emphasis on their ability to disassociate from discomfort (Ex. *She works her bus driver shift like a sexbot!*).

Discipline Common User

Adam has been going to the clinic on Euclid Avenue for two-and-a-half years now. His physical trainer had recommended Adam to give it a try a few months before he had his gastric bypass surgery. In the beginning, at 450 lbs., it was difficult to find the desire to exercise, but between monthly trysts at the clinic and water aerobics at the public swimming pool, Adam was finding it easier to stay motivated. When he first started at the clinic, it was a fun way to burn off calories, but after his surgery, he has found the clinic is really helping him gain confidence with his new body, sagging skin and all. In a few months, he will reach his target weight. He's been thinking about setting up a dating profile and getting back out there. Adam can't believe how much his life has changed. Life used to feel hopeless, and now it's full of possibilities, even love. He's proud of himself.

5.3 Collapse Scenario - Sex No Bots

By 2046, sex robots have been globally banned since the beginning of the decade. In the 2020s, more and more Western nations were expanding definitions of obscenity to include child sex dolls and robots, enforced through customs and import laws. Activist groups looking to end sex robots saw this as an opportunity. If society could be persuaded to believe that ownership of child sex robots should be outlawed, then maybe the argument could be expanded to sway public opinion on sex robots themselves.

First, they sought political backing to amend the existing laws. Luckily for these groups, "Child sex robots are wrong" is not a hard argument to make. It wasn't difficult to find politicians that were willing to publicly denounce child robots, especially those with conservative constituencies. With importation already illegal, "ownership" was added as an equal offense, and the consequences and punishments for both counts were made more severe. With Western nations and the EU in consensus, a well-publicized global agreement was brought to the UN in early 2025, banning child sex robots once and for all.

At the same time, several activist groups saw the import part of the equation for what it was: child sex dolls were not being made domestically, they were manufactured abroad. Foreign manufacturers were sought out and targeted. With nearly every head of state on social media, activist groups began a two-prong campaign of public shame. Addressing political figures where child dolls were being built and tagging local media all but guaranteed ample news coverage. Now under the complete control of China, Hong Kong distributors were shuttered within months. Locations across the globe were soon to follow. In the winter of 2026, after years of being indifferent to public opinion, the last remaining child sex doll manufacturer in Japan was forced to close when the land the factory was located on was re-zoned for non-commercial use. With this came the end of both child sex robots and child sex dolls, and a huge win for human decency.

Next, activist groups pivoted to sex robots as a whole. At this point, sex robot brothels were in most major cities, enjoying moderate popularity. Initially, activist groups tried coordinating with local sex worker unions to have them shut down but were surprised to be met with disinterest. Having spent years working side by side with robots, most sex workers had come to find that the kind of client that gravitates towards a sex robot wasn't going to meet with a human worker anyway. That is, there wasn't an overlap of clientele, and therefore the robots weren’t seen as competition. Some sex workers had found ways to incorporate sex robots into their own work and had become quite fond of them. Instead, anti-robot activist groups ultimately coordinated with local women and child advocacy groups to have local prostitution laws revised to include sex robots. This was easiest to accomplish in areas where prostitution was not legal to begin with. Other amendments prevented sex robots from being sold in stores or on websites registered to a nation's domain extension; to do so was interpreted as "the sale of sex acts and services", and an iteration of prostitution.

Again, it was not difficult to gain the support of local politicians that claimed to uphold family values. Some goals were easier to accomplish in bi-partisan nations like the United States, where legislative backing of one's party is almost perfunctory. It was a long-view plan that worked wherever they could squeeze in a clause or an amendment, whenever conservative parties had the majority. It only took waiting for right-leaning and conservative parties to have majority rule, or the presidency, and push forward their agenda. Within a decade and a half, Canada, the UK, Japan and Australia had locked in a ban. Finally, within a year of each other, the EU and the US also banned sex robots. Any backlash was rarely given mainstream media coverage, and those who did oppose the ban did so on moral grounds, fighting against what they viewed as threats to "freedom" and personal pursuits, rather than having a vested interest in protecting sex robots.

Like other banned technologies and criminal activities, the problem persists, and continues to exist, albeit underground. People still try to make their own sex robots, but without major capital investment and access to research and design, the end-product is usually clumsy and awkward. The easiest work-around is to buy a sex doll and buy a robotic head, and try to install an armature yourself, like 3D-printing legal gun parts that combine to make an illegal weapon. There are services on the dark web that will do the installation for you, and some do a decent job at that, but the robots aren't very ambulatory or sophisticated. Some people try to make sex robots out of existing robots. These too are rudimentary, and hardly persuasive.

People still fall in love with inanimate objects because there will always be people that can project their ideal partner onto an inanimate vessel. These are far from the human-robot partnerships once imagined, and certainly not the future Levy had predicted when he dreamt of huma to robot marriages. In this future, sex robots, like human clones or replicants, are mostly relegated to the world of media depictions and science fiction. They continue to be portrayed as cyberpunk anti-heroes, dark horses, and underdogs; femme-fatales played by impossibly perfect movie stars.

Collapse Common User

Aaron has been trying to get a working sex robot for years. Aaron has never had a girlfriend and thinks he probably never will. Before the *stupid* ban, there were a few companies that actually made sex robots, but since the software they ran is no longer updated, and can't connect to a server, trying to find one is an expensive and ultimately worthless endeavor. It's hard enough to find someone willing to part with an older model robot that has the features he wants, but if the app that controls the robot's personality is inaccessible, then *what's the point*?

There's a vendor on a dark web market that reportedly does a decent job, but with no positive reviews vouching for the vendor, he could easily get ripped off. He could receive a glitchy robot, or no robot at all. It's not like he can complain to the Better Business Bureau that the illegal robot he ordered never showed up. Plus, the vendor seems to be based in Thailand and getting it through customs and into Washington would be a whole other hurdle. He's tried assembling one himself, but the robotic head he found online didn't match the body of his love doll and ended up looking cartoonishly large. He doesn't understand why everything has to be so frustrating. He just wants someone who wants him. Depends on him. Will never leave him. None of that seems possible when he can't get a woman to even look at him. He has his love doll Vanessa, but she doesn’t respond or say anything. Sometimes he runs his virtual girlfriend app through a speaker and he pretends it's Vanessa talking, but it's not the same. He knows it's not Vanessa talking -she just sits there with unblinking eyes, mocking him- and truth be told, Migi, his virtual girlfriend, is nothing like Vanessa.

5.4. Transformation Scenario – Roborelationships

In this final scenario, sex robots as domestic robots are quite common, especially amongst married couples in their later years. Couples of the same sexual orientation typically choose to share one interchangeable model, and domestic pairings of different orientations tend to purchase their own separate models. Meaning, couples that formerly slept together are usually more comfortable sharing the same robot. Wider acceptance of sex robots has compelled the industry to have sex robots meet the cornucopia of human sexuality.

Sex robots are dynamic in shape and function, turning sex with a robot into a highly pluripotent experience. This access to such variety in one body, causes a portion of people to prefer robot sex to human sex, but not all are attracted to robots themselves. It's more like preferring sex toys in masturbation- people don't become attracted to their vibrator but find them necessary to achieve orgasm. Then there are other folks who do identify as robosexual and will run their robots constantly, bringing them on public dates. They are genuinely attracted to their robots and quite happy living with them. It is a common practice for robosexuals to buy plane tickets for their robot partners when going on vacation, rather than allowing them to be stowed under the plane as luggage. Some have married, and even divorced, their robots.

Sex robots are a big hit in the Furry community. Fur-bots, as they are called, have become as vital a component to expressing one's sexuality as fur-suits once were. Dragons, oversized rabbits, lots of wolves. The Furry community has already had years of experience balancing animal characteristics and the humanoid form. What's more, they appreciate the selection of quality materials and craft that goes into making fur-suits, which translates to how they gleefully customize every detail of their fur-bots. There is one company that's the go-to for the fur-bot community, Golden Fleece Designs. On occasion, they get the odd customer order for an animal design that is a little too close to realistic for comfort, but the company has made it their policy to unilaterally reject such requests.

For the most part, people who use sex robots exclusively for sexual gratification, don't engage a whole lot with the AI. Those that use their sex robot for comfort or entertainment, will. A lot of young people don't tend to converse with their robots, as there are already quite a few social robots and personal assistant devices in the home already. Other groups, like the Furry community, will spend as much time creating the characters that will inhabit their robot, as they did on the robot's outward design. Generally, the more time spent on achieving a look, the more care goes into creating a personality.

Some parents will purchase a sex robot for their own children once they have become of age, preferring they experiment at home, rather than expose themselves to risk, or pressure other teens into sex for the sake of satisfying their own urges. This type of parenting is questioned and defended across social media and on daytime talk shows. The argument is that it will cause children to grow up identifying as robosexual, implying that this is an unfavorable outcome. While there is research on the impact of early sexual impressions, there is no evidence that has shown a direct correlation between educational usage of sex robots and robosexuality in adulthood. The vast majority of people that used sex robots in this manner during young adulthood tend to gravitate towards human-to-human relationships of various orientations. As one parent put it on the Morning Show, "No amount of technology can out-program mother nature's design on teenage hormones. They're going to try to have sex anyway, at least this way I know he's not pressuring any of his classmates, much less making a grandmother out of me."

Rather than have sex robots for minors look like adults or other young people, they are what's called an anamorphic base-model, that come in white, chrome, champagne gold, or gun-metal grey. They have programs about consent and birth control and are intended to graduate the teen towards human relationships. They come with restriction settings that prevent mishandling or undesirable behaviors. These "undesirable behaviors" are determined by the parent and child together. The parameters of the robot's programming are usually designed in consultation with the minor, their guardian(s), and a psychosexual therapist. This consultation turns into a kind of "birds and the bees", and the teen is taught how to operate the robot, and the importance of treating bodies with respect. There aren't any cameras in these models, but they do have gyroscopes and other sensors that can indicate signs of violent behavior, which can be reported if the parents request it. Parents can also set usage limits.

In this future, technology has been incorporated as one of the key concepts of UNESCO's Comprehensive Sexuality Education program, which sets international sex education standards. This part of the program educates people on the importance of appropriately handling technology, which can range from the impact of sending nudes, online predator awareness, cyber-consent, and sex robot remote avatar technology.

There are instances where people have used sex robots and the robot's legal standing to set legal precedent. These situations usually lean towards the benefit of the human involved, unless unsafe or dismissed. For example, some people have used robot marriage as a loophole to take advantage of certain legal situations. One woman famously chose to marry her sex care robot on her deathbed. This came at a time when her adult children were squabbling over their potential inheritance. She used the robot to bequeath her estate to it, and make sure it would carry out her final wishes, which she was able to program, and included provisions on how long she wished to be kept on life support. Sex robots, and other social robots, used in this way, have redefined the boundaries of laws in many countries, causing robot law to become a specialty of practice.

Transformation Common User

Miranda designs robo-play kits based on fictional characters. She meticulously hand sews bespoke outfits for her customers' robots, and codes equally well-crafted character mod programs for her customers to download and install. Selling robo-play kits has become a cottage industry and flourishes in different online communities. For Miranda, it started as a hobby in high school, making different characters come to life for her own robot, while she struggled with her identity and gender. But after making one for her partner, who shared the program with friends, who in turn begged her to make them their own, she knew she was on to something. Miranda has now become a celebrity within her niche, renowned for her ability to inject life into her programs and a knack for designing trans versions of popular characters.

Miranda loves going to sci-fi and anime conventions, where robo-play enthusiasts are a regular fixture, just like their cosplay counterparts. She regularly gets a table at all the big conventions, where she can make more sales in one weekend than in a whole month online. More than that, she loves to meet her fans and see her costumes in action. Recently, some production companies have taken note of Miranda’s fan base and she has been approached for a few character-design projects. Over time, as a direct influence of robo-play, character design in the film and gaming industries has become increasingly dynamic. Rather than fictional characters that simply move along a plot or game, they are thought of as characters that one might argue with, take on a picnic, or live with. It's Miranda’s dream to work for Disney, designing DC and Marvel characters for their ani-bot lines. Ani-bots are non-sexual robots, marketed towards kids. Most people would probably be surprised to learn that the best ani-bot designers trace their roots back to the sex industry, just like she does.

Chapter 6. Discussion and Conclusion

This chapter discusses the story elements from the preceding scenarios and provides insight on how the narratives were constructed. How the factors behaved within the scenario archetypes is also discussed, and how current trends influenced the narratives. Finally, a Causal Layered Analysis is applied to each of the four scenarios, followed by the conclusion.

6.1.1 Continued Growth

As one can see, the Continued Growth scenario continues to operate under the current worldview and systems of American society. Namely sex and the market are intertwined in a neoliberal fashion, with a dominant patriarchal worldview. Outside of consumer sexual gratification, sex robots are predominantly used by those who can exploit them as a tool for financial gain; entertainment services, sex workers and even contractors to the US Prison system take advantage of sex robots for profit.

The idea of the “remote avatar” technology comes from the commentary section in the disability questionnaire, where participants talked about having an avatar feature. The Remote Avatar is also inspired by presently existing technologies for long-distance couples like Kiroo[18]. The common user, Alex, accesses her robot solely to produce pornographic content she sells online, as her primary source of income. The app she uses is directly inspired by OnlyFans, a popular subscription service that allows members to sell self-made pornography. OnlyFans is used by celebrities and amateurs alike of all genders and is heralded in some feminist circles as “one of the safest and least exploitative forms of sex work”, placing women in complete control of the content the produce and distribute (Theresa). The SiiMii platform in this future is an ultra-competitive, accelerated version of OnlyFans. Alex’s financial situation brought her to this line of work, and the sex robot allows her to engage in penetrative acts without another human partner. This offers some control over the process (or at least, the feeling of control), the same way webcams allowed people in the late 90s, and throughout the 2000s, participate in ‘cam-porn’ from the comfort of their own home and dictate their levels of participation[19].

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[18] See Section 2.5.1 Teledildonics and the Internet of Things

Within these scenarios, we see two pictures of what can happen if the sex tech industry was left to its own devices to develop security. In the Continued Growth version, the industry has been lax. This is evidenced by the many references to hacking and scams. Even the “lounge” business model is built around providing an alternative venue that caters to the public’s lack of trust in the security of most devices. Poor security will create an environment that allows rape by deception to thrive, and so multiple examples are incorporated into this scenario. Here, rape by deception through hacking has become such a common occurrence that it’s a trope in pornography, to the degree that it is parodied. This already exists today in the form of revenge porn and leaked celebrity cloud data, which have also been faked.

The concept of Sponsored Content Conversations -whereby program subscription fees are waived if the user agrees to listen to ads incorporated into the robot’s dialogue- was taken from a comment RenderMan had made, that “manufacturers will want to profit if they can find new and interesting ways to do so”. This business model is common to many subscription services today, that provide content upfront for free if users submit to watching advertisements, and then are given the option to “upgrade to pro/premium” for ad removal.

Sex robot addiction in this scenario is a manifestation of the long-term effects of supernormal stimuli discussed by Dr Brandon. This follows the trend of technological addictions we have seen in decades past, like video games, pornography, and even internet addiction. These addictions to technologies inevitably develop whenever reward centers in the brain are hijacked, and the addiction is relentlessly pursued to the detriment of one's quality of life.

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[19] Of course, there are still instances where people have been exploited into participating in cam-porn or even non-pornographic live-streaming.

Factors: High Design Proliferation, Negative Sexual Attitudes, Industry Regulated

In this scenario there are many different industries investing in sex robot production, leading to a high proliferation of design. However, because sexual attitudes haven't changed in this future, a lot of the problems people take moral issue with surrounding sex robots have not been addressed. This shows us that new forms alone will not be enough to divorce sex robots from their misogynist underpinnings.

As far as regulation goes, the sex industry has been left to its own devices to design security and safety practices. In this scenario, we see a consumer base that is not empowered to make better choices or demand better options regarding security. Here, the consumers simply assume that companies would *want* to design their products securely. When this turns out to not be the case, users are forced to accept risk and the high prevalence of hacking as a by-product of the digital world.

6.1.2 Discipline

This scenario considers another finding of the questionnaire, which suggested sex robot usage would be looked upon more favorably when the masturbatory element was removed and instead framed as a component of health and maintenance. The narrative for the integration of the sex care clinics is influenced by the path taken by medicinal marijuana dispensaries in the United States; a slow and controlled integration of a community service formerly regarded as immoral. Heroin clinics in the Netherlands are also mentioned, as they too were once sensational, but are now largely accepted, and even applauded, once the benefits became apparent (Fischer et al.). The registry for sex robots and other social robots, is taken from present day EU Parliament considerations, described in the Literature Review[20].

The choice to include the element of plastic surgery in this scenario was due to its position on the axis relative to design proliferation[21]. Even with a more positive attitude towards sex, more priority has been placed on program design. As far as outward appearances, sex robots design is rather stagnant, with clinics utilizing a sweet-talking gynoid form to address the needs of male patients. The limited range of sex robot design has created an aesthetic that communicates "*this* body is sex". That they are used in a medical setting lends an air of scientific authority and validation, whether intentional or not. The same way medical visual aids overwhelmingly featuring Caucasian bodies tacitly communicates a definition of the "average" human body, the sex robot, whose function is to heal deficits in sexual wellness or achieve orgasm, has come to define a vision of the ideal sexual partner. It is an aesthetic that some aspire to achieve. The idea for surgically pursuing this aesthetic came from the interview with Professor of Robotics Hiroshi Ishiguro[22], where he shares his desire to look more like his android self, and other plastic surgery trends. Plastic surgery goals have long been shaped by technology (i.e., the distribution of the porn-star image, AR photo filters). In 2017, a survey by the American Academy of Facial Plastic and Reconstructive Surgery found a rise in plastic surgery requests that mentioned 'selfies' during patient consultations (Welch). This trend would continue into 2018, leading to the phenomenon known as "Snapchat Dysmorphia" (Davies). Additionally, there have already been documented instances where people have sought out a sex doll aesthetic through plastic surgery and body modification (Moore; Hartley-Parkinson; Flood), in that regard, for a person to want to look like a sex robot is not so much a leap as a step in the same direction.

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[20] See Section 2.7.3 Philosophy and Robot Rights

[21] See Figure 4: Design Proliferation and Sexual Attitudes represented on a Double Driver Matrix

[22] See Section 2.4 Human-Robot Interaction

In the Discipline scenario, sex robots are mostly used as tools to fulfill health needs, as opposed to being a consumer indulgence. Findings from the questionnaire had suggested customizable features would likely drive the consumer market for sex robots. The elements of this scenario are still in line with this finding; while sex robots are mass-produced for the healthcare field, and are not common private purchases.

Factors: Low Design Proliferation, Positive Sexual Attitudes, Government Regulation

The Discipline scenario is higher on the spectrum of a wellness mindset than Continued Growth, which is reflected in the different types of publicly accessible sex robot services. In the Continued Growth scenario, the sex robot lounges are used purely for sexual gratification. In the Discipline scenario, clinics integrate sex robots into health and therapy.

Here we see positive sexual attitudes interplay with regulation and low design proliferation. Sexual wellness is socially valued, and sex robots as a tool for achieving or maintaining sexual wellness are given serious consideration. In this future, sex robots are classified as medical devices and fall under the scope of data protection laws. Due to the high standards of HIPAA and other pre-established privacy protection acts, cybersecurity for sex robots is solid and well maintained through thoughtful governance. As discussed, positive sexual attitudes lead to the integration of sex robots into healthcare, making the medical field the number one customer of sex robots. Consequently, there are not many makers of sex robots, resulting in a narrower band of design types.

6.1.3 Collapse

This scenario captures the feminist goal of banning sex robots, despite being placed on the axis further from holistic attitudes about sex. As such, this goal is accomplished through the mechanisms of a patriarchal political system, and no wider social transformation occurs. Had a social transformation, or paradigm shift, been at play, then the ban would be assumedly unnecessary as this type of 'woke' society would not likely provide the market for the version of sex robots being campaigned against. This scenario is a telling of what would happen if, as Kubes put it, feminists “sacrifice any chance of contributing to the shaping of future post-humanist sexualities” (Kubes, 2019b).

The strategy the activist groups follow in this scenario is directly inspired by steps taken today to eliminate child sex robots. That is, through the expansion and amendment of customs and obscenity laws. Importation laws are a softer way to restrict what people can own, without an outright declaration on a product’s legality, or the appearance of infringing upon freedoms. The tactics deployed in the campaign to close child sex doll manufacturing centers was inspired by the brothel closure in Houston, Texas, where public shaming, local political attention, legal harassment and land re-zoning were all used in concert to shut down the brothel before it could open[23]. This tactic was also partially inspired by a letter writing campaign and petition enacted in Queensland to keep child sex dolls out of South Australia (Mortimer).

In this scenario, the most important actors are politicians. Those who prefer this scenario, should try to identify which politicians have interests that best align with their own, and investigate ways to influence them to act in their organization's best interest. To have the activist groups pursue conservative politicians for endorsement was inspired by a comment Renderman had made about politicians' desires for re-election and tendency to align themselves with social mores[24]. The Campaign Against Sex Robots has done the same in the United States with their endorsement of Republican Daniel Donovan Jr. pushing through the CREEPER Act of 2017 (Richardson, 2018). One of the positive elements of this scenario is the global coordination it takes to enact this type of universal ban. It relies on uniting over dialogues and common goals, working to achieve a shared vision that at its heart tries to pre-empt risk of violence to women and children.

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[23] See Section 2.2 Sex Robot Prostitution and Law

Finally, there is the common user, while he did not use sex robots, he was certainly trying to. His attitude that he somehow *deserved* a sex robot, and his frustrations, are modeled after the members of today's incel and MGTOW communities.

Factors: Low Design Proliferation, Negative Sexual Attitudes, Government Regulation

This scenario is the most extreme form of government regulation, in that they are made completely illegal. Low design proliferation is an obvious consequence. This scenario also depicts what this ban would look like if there wasn't also a change in society's sexual attitudes and suggests fundamental social transformation would be the real win, which is of course, also a feminist goal.

6.1.4 Transformation

This scenario sees the widest adoption of sex robot technology and leans heavily on the vision of "Sexbot Induced Social Change" presented by Marina Adshade[25]. Here we see different types of domestic pairings, like parents of different sexual orientations, whose sexual needs are met by their sex robot. These pairings go on to influence and eventually redefine the family unit.

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[24] See Section 4.3.6 Empowering Consumers

[25] See Section 2.7.1 Marriage

As domestic use is highly prevalent, this felt like the most apt scenario to address the issue of robot-related sexual imprinting that Dr. Brandon discusses[26]. As mentioned, most sexual imprinting takes place during the years of early development, and so introducing robots during the teenage years is not likely to be as subconsciously impactful in future mate selection. This effect is more likely to occur in children that grow up in households where robots are continuously present, and witness their parent's preference for the robot, combined with impactful events during the child's early development. Research indicates that while *some* intense object paraphilias *might* develop from experiences during this sensitive period (Aronsson, 70-71), it is far more likely for sexual imprinting in humans to result in general preferences towards physical characteristics like waist-to-hip ratios or facial-features (Aronsson, 69; Marcinkowska & Rantala; Wiszewska et al.,).

In their current form, giving minors access to sex robots is highly contentious. Even those who are emphatically open-minded to the applications of sex robots have stated unequivocally that minors should not be given access to them (Bendel, 2016, 25), while others believe that there could be benefit for sex education purposes (Brandon, 2021). Due to the positive sexual attitudes of this society, and the amount of design proliferation, sex robots as an educational tool are possible, in a way that is not ethically nor morally reprehensible.

The inspiration for using sex robots as a tactic for exploiting legal loopholes was partly from one of the interview conversations that didn't make it into the thematic analysis, where Ryan Calo shared his opinion, that while sex robots weren't likely to achieve legal personhood, there have been examples in the past where animals and even non-entities are granted "rights" in courts. In some cases, these rights are evoked when dealing with a person's estate after death, the manifestation of these rights designed to conform with said person's wishes (i.e., a beloved pet receiving an inheritance).

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[26] Section 4.3.3 New Vulnerabilities

The narrative surrounding the common user in this scenario sees the protagonist thriving in a community of user engagement. This was influenced by Oliver Bendel's paper "Love dolls and sex robots in unproven and unexplored fields of application", discussing social groups that might employ sex robots. Here he mentions gamer and cosplay communities tend to have a predilection towards romanticizing fantasy figures (Bendel, 2021, 9-10). These divergent forms of sex robots were mentioned in an empirical study performed by Scheutz & Arnold, whereby 'fantasy creatures' was ranked as the most appropriate form for sex robots to take, after adult humans, out of 10 possibilities (Scheutz & Arnold, 2017, 5). In Miranda's narrative we also see a continuation of the longstanding tradition for the sex industry to inspire new forms of technology as its products evolve and dissipate into the general population (Johnson).

Factors: High Design Proliferation, Positive Sexual Attitudes, Industry Regulated

The security in this scenario is industry regulated. While regulation doesn't seem like a prevalent element in this scenario, that is intentional. Good security, like strong practical design, often goes unnoticed. Usually, we are not aware of a product's security or a program's user-experience design until after we encounter difficulties. The variety of design is reflected in the multitude of forms available, from the zoomorphic inclined tastes of the Furry community to the educational models for young people. Positive sexual attitudes are reflected in the new types of domestic pairings, and the way that sex robots are used in the home (strengthening relationships, sex education).

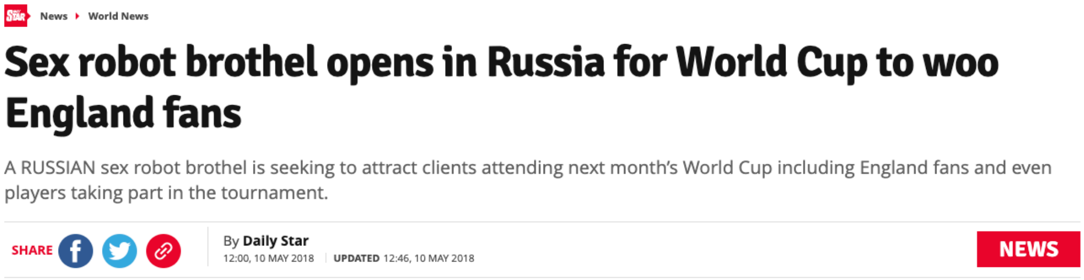
6.2 Causal Layered Analysis

Causal Layered Analysis, developed by Sohail Inayatullah, is a Futures Studies tool that explores the architecture underlying social constructs (Inayatullah, 2005). Within the framework of CLA is the belief that the social (behaviors, culture, and actions) takes place above a deeper layer of constructed meanings and values. These constructs validate power dynamics and facilitate, or obstruct, positive transformation. The purpose of separating society from its constructs is to provide the opportunity for social change when the meanings and values change, rather than limiting society to inevitable circumstances ("that's just the way things are").

When applied to scenarios, CLA reveals the fundamental differences that have allowed one scenario to take root over another. The analysis is done at four levels: litany, system, worldview, and myth. *Litany* represents the facts and figures, statistics, and headlines. *System* brings further context, the framework in which the litany operates. *Worldview* is the ingrained social perspective that allows the context to thrive, the tacit agreement the community makes for the system to operate. Lastly, *Myth* is a metaphor that can be used to describe the society. Revealing the myth provides a succinct and accessible way for people reflect on their worldview and glean insights to their motivations (see Methodology 3.7 for more).

For the Litany part of the analysis, rather than collect invented details and figures from the future scenarios, I've decided to look at present-day litany, in the form of media headlines. These headlines are considered from the perspective of the different futures, treating the present as a historic point of divergence for the four timelines. Gathered here are headlines of news articles from mass media outlets, recontextualized by the narratives they support. For each scenario, one headline is highlighted and shown in its original graphic form, which serves as further context. At times, even stylistic choices can unconsciously represent elements embedded within the narrative.

6.2.1 Continued Growth



News ▸ World News

Sex robot brothel opens in Russia for World Cup to woo England fans

A RUSSIAN sex robot brothel is seeking to attract clients attending next month's World Cup including England fans and even players taking part in the tournament.

SHARE

By **Daily Star**
12:00, 10 MAY 2018 | **UPDATED** 12:46, 10 MAY 2018

NEWS

Fig. 6

Continued Growth Headlines

China company enjoys booming business with AI sex robots	*Agencia EFE* 24 May 2018
World's first brothel staffed entirely by robot sex workers now looking for investors to go global	*The Sun* 20 Jul. 2017
Sex robot brothel opens in Japan amid surge of men wanting bisexual threesomes	*Mirror* 27 Apr. 2017

The headlines grouped under Continued Growth are centered on industry and wealth generation. They talk about high demand, popularity, and investment. The language here has a lot of positive economic buzzwords like 'go global', 'booming', 'surge', and 'attract clients'. All of these headlines belong in the world that develops in the Continued Growth scenario. They paint sex robots not as a socially divisive technology, but as a potential new market. The featured headline (Fig. 6) was selected for the contribution of its subheading and overall content. Human trafficking and prostitution are known to flourish during major worldwide sporting events, like the Olympics, Superbowl, and in this case, the World Cup. This article belongs in a world where artificial prostitution is no different. The subheading positively frames sex work customers as "clients" and insinuates sex robots could provide a less problematic alternative to prostitution for the professional athletes.

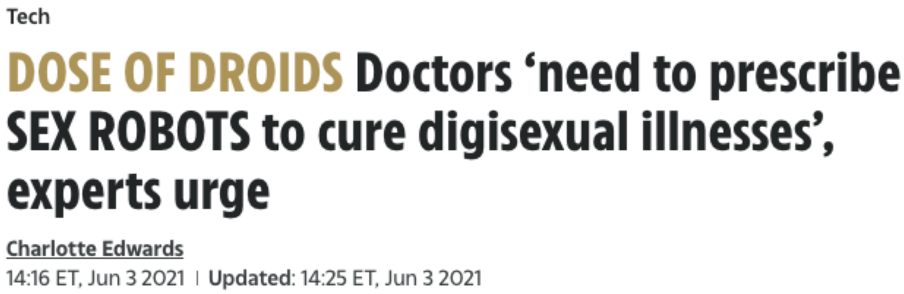
Before beginning the discussion on the systemic level, it is important to say that these scenarios were not created *for* CLA. A Causal Layered Analysis is being applied to the discussion of the scenarios. The system represented in Continued Growth is blatantly neoliberalist capitalism. This doesn't mean that within the other scenarios, the United States ceases to be a capitalist society within the next 25 years. Creating scenarios in this way, for the sake of the exercise alone would be an exercise in futility. As Mark Fisher is famous for having said, it is easier to picture the end of the world than the end of capitalism. However, that does not mean we can't imagine futures where neoliberalist capitalism is no longer the dominant social driver. So, while in the Continued Growth scenario sex robots serve wealth-making, in Discipline they serve preventative health and maintenance, in Collapse sex robots are used to achieve order and attempts at sense-making, and in Transformation they serve relationship building. In this reading, how sex robots are used reflects the higher values of these societies.

In the Continued Growth scenario, the worldview is 'Money Must be Made'. Everyone is working in some form, while corporations and companies collect the most benefits. Everything has become commodified, even the relationships between people, and the sex act itself. People and their bodies have always served as labor, but in this future, even intimacy can serve as a commodity, a digitized product for corporate profit. In this future even one's agency seems like it can be coded, programmed, and hacked.

The story of Pygmalion is a commonly evoked myth in the literature on sex robots. Pygmalion was a lonely artist that despised the faults of women around him, whom he regarded as difficult and whorish. Committing himself to celibacy, Pygmalion sculpts his ideal mate, beautiful and unspeaking, out of white ivory. He names her Galatea. Pygmalion treasures the statue, bringing it gifts and sharing his bed with it. Pygmalion begs the goddess of love Aphrodite for a woman like his Galatea. In the end, his wish is granted, and Aphrodite turns the statue into a woman. This all clocks when we consider how sex robot manufacturing emerged, based on a male vision of the perfect woman, or a means to access sex while by-passing the difficulties of corporeal relationships.

Except in this scenario, Pygmalion's Galatea turns out to be a Monkey's Paw, folding in a second myth. The Monkey's Paw is an English story from the early 20th century, about a supernatural object in the form of a monkey's severed hand, that can grant its owner wishes. The story has been retold in many forms, but the one consistent element is that whenever the owner is granted a wish, it is in the worst way possible. As an example, wishing for money comes at the cost of an insurance settlement following the death of a loved one. It's a common trope, be careful what you wish for. In this case, yes, you can maintain a sexual relationship with your long-distance partner, but those experiences might be leaked on the internet. Yes, your widowed parent can be left alone and still maintain their dignity, but they might be exploited into losing their life savings. Yes, you can earn a passive income without leaving your bedroom, but strangers dictate what you do there.

6.2.2 Discipline



Tech

DOSE OF DROIDS **Doctors 'need to prescribe SEX ROBOTS to cure digisexual illnesses', experts urge**

Charlotte Edwards

14:16 ET, Jun 3 2021 | **Updated:** 14:25 ET, Jun 3 2021

Fig. 7

Discipline Headlines

Fifty shades of vulnerable: How to play it safe with your smart sex toy	*We Live* 12 Feb. 2021
That Cool Robot May Be a Security Risk	*The New York Times* 01 Mar. 2017
Sex robots are here, but laws aren't keeping up with the ethical and privacy issues they raise	*The Conversation* 12 Feb. 2019

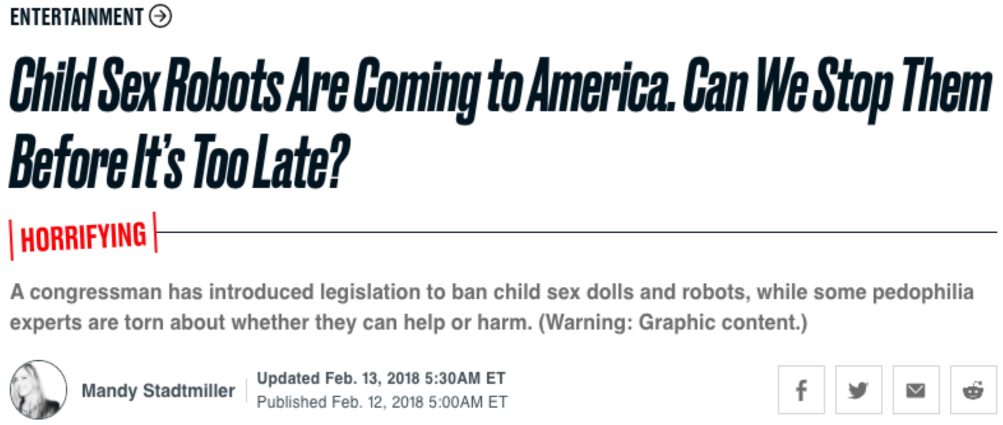
The language used in the headlines for the Discipline scenario is more restrained and cautious when compared to the other scenario headlines: ‘play it safe’, ‘*may* be a risk’. While the featured headline does use tricks to be attention grabbing -sex robots is capitalized unnecessarily, and there’s the punchy and alliterative ‘Dose of the Droids’ phrase prestaging the headline- it is leaning into the idea that sex robots can be used for a medical purpose, and has words like ‘doctor’, ‘prescribe’, ‘experts’ and ‘cure’. We can see the article is categorized under the Technology subheading of this news outlet. This paints a more positive picture of sex robots, and gives the robots a medical credence, as opposed to portraying them as raunchy sex machines used to incite threesomes. The other headlines in the Discipline group are focused on being proactive and mitigating future risk. This speaks to the Discipline trope that requires social systems to be well planned and designed to manage technology in a responsible and sustainable manner.

The Discipline society is an organized social system that values privacy and security. Privacy has already come to be an essential component in Western medicine. This used to mean that your care providers were not at liberty to disclose your medical information. Increasingly, privacy and security go hand-in-hand, and so information security has also become fundamental to healthcare in this scenario, not only within the industry, but on a social scale. It is an expectation of patients.

The social system in this scenario, while having positive sexual attitudes about the overall benefits of sex, still has heteronormative leanings. Therapists are involved in the software design process of sex robots, but the aesthetic design remains the same. As a result, the few design choices made assign gender attitudes to the product. The worldview here is a belief in ‘Order Through Structure’; *Ordo Ex Structura*. Society shapes the tools of its system to service this worldview. In this scenario, security is enforced through governance, and the bureaucratic nature of large democracies is a benefit to this end. There are many larger mechanisms in place throughout the scenario to provide the individual with a seamless user experience.

The society in the Discipline scenario works hard to be prepared in advance of any dangers, from designing policy, to creating secure systems. This is evocative of Aesop's fable, "The Ant and the Grasshopper". For those who don't know the story, briefly, a grasshopper watches a group of ants toiling on a summer's day to prepare their winter stores. As he watches them, the grasshopper plays music and mocks the ants for not enjoying the good weather, beckoning them to join him in merrymaking. The ants insist on finishing their labor to prepare their colony for the coming months. When winter rolls around, the grasshopper is caught unprepared and goes hungry. He returns to the ants and begs them for food. In some versions the grasshopper is turned away, in others he is invited to join the ants in humility and plays his music for them to give thanks. The moral of the story stresses the importance of preparing for hard times while the weather is still fair. This can be applied to foresight, intelligent systems design, and risk mitigation, all of which are attributes of the Discipline society. Of course, this strict society is not meant to be fun. Artists and individuals, like the grasshopper, may not thrive in a rigid system but can still benefit from it in the long run. In the version of the story where the grasshopper is invited inside, artists provide a sorely needed and refreshing perspective to the conformity of discipline.

6.2.3 Collapse



ENTERTAINMENT

Child Sex Robots Are Coming to America. Can We Stop Them Before It's Too Late?

HORRIFYING

A congressman has introduced legislation to ban child sex dolls and robots, while some pedophilia experts are torn about whether they can help or harm. (Warning: Graphic content.)

Mandy Stadtmiller

Updated Feb. 13, 2018 5:30AM ET
Published Feb. 12, 2018 5:00AM ET

Fig. 8

Collapse Headlines

Swedish feminists demand a ban on sex robots because they are 'dangerous' and dehumanize women just like pornography	*Daily Mail* 21 Feb. 2019
Sex robots BACKLASH as brothel workers reveal fury over 'dehumanizing and dangerous' droids	*The Sun* 18 Sep. 2018
SEX ROBOTS ARE BEING MADE FOR PAEDOPHILES AND COULD ENCOURAGE ALL KINDS OF SEXUAL ABUSE, PROFFESSOR SAYS	*Independent* 05 Jul. 2017

The headlines in the Collapse scenario are the most heavily formatted. They are unapologetically fear-baiting. A sense of extreme urgency is created, and words like 'dangerous' and 'abuse' are given emphasis. Caps-lock is used to draw the eye, with one headline entirely in capital letters, completely offsetting what should be the operative word, 'could'. We see the exact phrasing 'dangerous and dehumanizing' used a year apart from each other. The language in these headlines borders on violent: BACKLASH! ALL KINDS OF SEXUAL ABUSE! *Fury*! This language is largely manipulative and designed to get readers to imagine the worst possible outcome, an outcome, which a ban would effectively prevent.

The featured headline in Fig. 8 has the word 'HORRIFYING' under the headline where the article's categorization might be, in bright red letters, slightly skewed, evocative of being viscerally stamped on to the page. There's a graphic content warning preceding the article, which is describing a congressional hearing on the CREEPER ACT. Readers are encouraged to share the headline before reading the article, through the share icons. The same 'call-to-action' before finishing the article is also seen in Fig. 6, with the placement of the share icons at the very top of the page rather than at the end of the article. This encourages the reader into making a snap opinion about the subject matter and internalize the article's headline as the entirety of what is being communicated. This speaks to both the unchallenging "business-as-usual" mindset of the

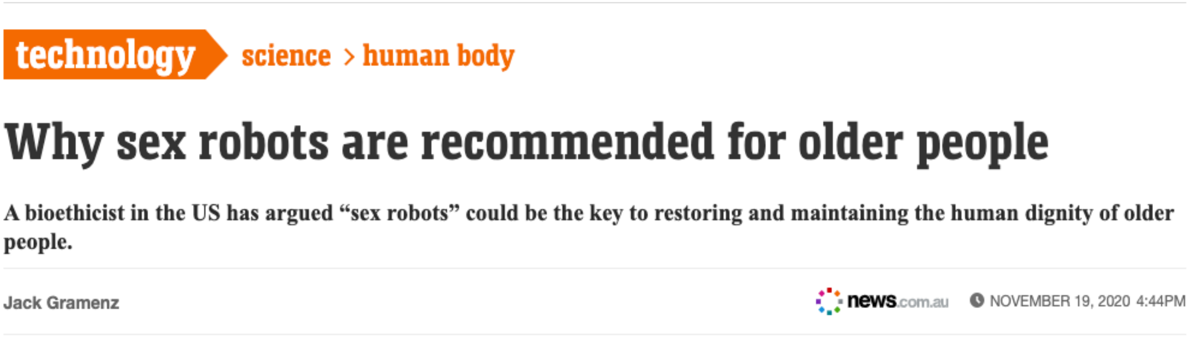
Continued Growth archetype, and the shutting down of open discourse which fuels the Collapse narrative.

This society feels that there is a way to decide who is perverse and who isn't, what is bad and what is not. The worldview becomes 'truth is objective'. Sex robots illicit unwanted behaviors, therefore, sex robots are inherently bad. Despite accomplishing a feminist goal, it is through a patriarchal system. In the Collapse scenario, sex robots never take off, they are instead used as a vehicle for enacting control, or to feel as if control is a possibility. This society relies on centralized power to institute change, rather than letting social instinct do the work. The story told in this scenario is that people cannot be trusted, and we need to manage and control their desires to protect society at large. It is a future that favors policing. Despite fighting off an instance of female objectification, the mentality of a ban promotes a top-down, father-knows-best, patriarchal-authoritative stance.

Of course, transformation of social values is a feminist goal, but this scenario demonstrates what happens when you have the "frosting without the cake". Frosting without the cake is a metaphor used in art instruction. It refers to students that get lost in the satisfaction of depicting details without learning the fundamentals, returning portraits that are meticulously rendered with glaring anatomical problems. In this scenario, feminists achieve the ends without the substance. The goal of abolishing sex robots occurs, without addressing the larger fears of why they ought to be banned to begin with. These fears have to do with the violent potential that resides in the maleness of strangers. Looking at history and statistics, these fears are not unwarranted. By abolishing sex robots, the problem hasn't really gone away, or been directly addressed. All those users, who were potentially one technology away committing real world sexual violence, on the cusp of falling into patterns of abusive, misogynistic behavior, remain. The dormant evils and toxic nature remain.

Years ago, I watched a talk where the speaker explained her experience with different waves of feminism using the metaphor of a pie. She started with how liberal feminists in the 60s were after “half of the pie”, then turned to neoliberal feminists, who seemed willing to sell out their sisters for mere crumbs. She concludes with radical feminists, who want nothing of the pie, only to shove it back in the faces of the patriarchy. I looked up this speech, with desserts and metaphors in mind, and was surprised to find that it was given by Gail Dines[27], an anti-pornography activist, and so I had to include it here. The feminists of this future are given a hollow substitution in place of “the pie”, but it is only a consolation. “The pie is poison,” Dines declares. This is what it means to use the methods preestablished by the patriarchy.

6.2.4 Transformation



technology > science > human body

Why sex robots are recommended for older people

A bioethicist in the US has argued “sex robots” could be the key to restoring and maintaining the human dignity of older people.

Jack Gramenz

news.com.au NOVEMBER 19, 2020 4:44PM

Fig. 9

Transformation Headlines

What Would Sex Robots for Women Look Like?	*VICE* 10 Jan. 2016
Goodbye Loneliness, Hello Sexbots! How can Robots Transform Human Sex?	*Forbes* 17 Jul. 2017
Robots with benefits How sexbots are marketed as companions	*The Conversation* 14 Nov. 2019

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[27] Earth at Risk Conference, 2014, *Fertile Ground Institute*

The headlines in the Transformation group appear to be oriented around inquisitive vocabulary and possibility, supported with question-words like ‘Why’, ‘How’ and ‘What would’. The intended emotional response of these headlines is a far cry from that of the previous group. Here readers are drawn in through exploiting their curiosity as opposed to triggering their outrage. These articles are open to critical engagement, discussion, and alternatives.

The featured article in this group (Fig. 9) is significant not only for its content, but the way the article has been handled. It is categorized by this news outlet under the subheadings ‘Technology’, ‘Science’, and the ‘Human Body’. Many articles on sex robots are routinely categorized under headings like ‘Bizarre’ or ‘Entertainment’; in other cases, by location, as broad as World News (see Fig. 8), or UK News, USA, Japan, etc. Placing this subject matter within the frame of Technology and Science, and more importantly in reference to the Human Body, speaks to the kind of perspective that will be needed to promote the positive sexual attitudes discussed in the Transformation scenario. Technology and Science are associated with objectivity, fact, and study. As for the Human Body, the connotation there is of health and wellness. That this term was chosen over “Health” or “Sexuality”, is also interesting. It might be evocative of one’s own body and personhood or speaking directly to the needs of the human body itself, now and into old age.

Another comparison we can make with all these news headlines together is, the articles that were grouped under Discipline and Transformation tended to be long-form articles, that were more thoughtful than attention grabbing. If these scenarios are to unfold, they would likely take more introspection and critical thought from the larger part of today’s society, and this is reflected in the media that supported these narratives.

The Transformation scenario is all about relationship strengthening, within the family and with oneself. Sex robots are used as a tool for this. In this scenario, it is people and users who benefit most, and experience the true gains. While of course, manufacturers still make money, their success is dependent on providing a product that meets the needs of its customers, which represents social expectations. Society might still be materialistic, but here the material serves the society a bit better, rather than society serving as the material for production.

The worldview here is ‘Integrity of the Whole’, at a personal level, at the level of relationships, families, and community. In the Transformation scenario, sex robots embody many of the elements in the Chinese myth of the female goddess NüWa (女媧). It is said that NüWa created humans by fashioning them out of mud, in an effort to cure her own loneliness. Some were lovingly crafted, while others were mass produced with mud and clay. NüWa is also credited with inventing marriage, as a tool for people to replicate themselves without her help (Wilkinson & Philip). She teaches them how to make love and treasure their children. NüWa is also said to be the first creature to befriend humans. As a major goddess, there are many legends that feature NüWa, but these elements are the ones I would like to focus on. Sex robots in this scenario can be considered the creations of a New NüWa, teaching people how to reinvent marriage and love their families, a new type of technological creature befriending humankind.

6.2.5 The Common Users

The individual users in these scenarios, embody the social systems that surround them. Adam, from the Discipline scenario, doesn’t have to think about all the work that has gone into the system he enjoys, and can focus on himself. In Transformation, Miranda is part of a much larger community, from her immediate network of friends that convince her to start programming, to the wider robo-play community that supports her. Miranda’s method of production and customer interaction is a far cry from Alex in Continued Growth, who also supports herself using technology and sex robots. Miranda interacts with her fans in dialogue and finds joy in creating for her audience. Alex performs for her audience through crowd-sourced commands, a fan base that feels entitled to her body, with their subscriptions acting as a stock holding in her agency. Aaron embodies that which has gone unaddressed in his society. He is the wound underneath the band-aid of a sex robot ban; the frustrated misogynist often caricatured within present-day media and intellectual discourse. The two male users and two female users could be the same people in different timelines. How society handles itself and sex robots in the coming years will greatly impact potential outcomes.

Table 5 on the proceding page summarizes the four levels of Causal Layered Analyses conducted on the scenarios.

Table 5. CLA of the Four Archetypes

Continued Growth	Robot Sex $ells	**Transformation**	Roborelationships
Litany	go global, attract clients, booming business	Litany	transform, benefits, how, what, why
System	values financial success	System	values community
World View	Money makes the world go round	World View	Integrity of the Whole
Myth	Pygmalion's Galatea as a Monkey's Paw	Myth	Gifts from the New NüWa

Collapse	Sex NoBots	**Discipline**	Robobureaucratic
Litany	fury, backlash, dangerous & dehumanizing	Litany	prescribe, play it safe, legal & ethical issues
System	values control	System	values technology & security
World View	Truth is Subjective	World View	Order through Structure
Myth	"Frosting without the Cake"	Myth	The Grasshopper & The Ants

Final Comments on Methodology and Limitations

When using the Four Archetypes method of scenario creation, we usually end up including some extremes that may seem dystopic, or unrealistic. There may be some that would prefer four scenarios that are more closely grouped within the realm of possibility or modern trajectory. I would remind folks that the purpose (and charm) of the Manoa Method, especially when used in tandem with CLA, is to deepen our understanding of the present, and to open the present to new social configurations and unowned versions of the future (Inayatullah, 2005).

That being said, I have used both methods in slightly alternative ways. Most notably with how I chose to approach the Litany level of the Causal Layered Analysis. Using contemporary headlines for future scenarios is not something that is commonly done; however, I found it a worthwhile exercise and enthusiastically recommend it for other Futures Studies practitioners. In addition, the element of the common user, or creating an everyday character for each of the scenarios is another exercise I readily endorse and know I will return to. As stated, when creating scenarios, the story elements need to be grounded in reference, one cannot just paint whatever picture they choose. However, once this has been done adequately, sculpting a character that lives within the narrative can be a very rewarding process that embraces creativity.

Conclusion

In this paper, four scenarios of possible futures for sex robots are created, along with a background to the current context of sex robots and their potential uses. Interviews were held along with a consumer study to provide the data for generating these scenarios. Time will tell which, if any, of the scenario components will come to fruition. A summary of how these scenarios can be used to directly answer the research questions can be found in Tables 6 & 7.

Table 6

Q1. What are future alternative applications for sex robots, beyond consumer sexual gratification?

Scenario	Alternative Applications Explored
Continued Growth	Sex Robots can be used for revenue streams and as security exploits.
Discipline	Sex Robots can be used for working on physical and emotional wellness.
Collapse	Sex Robots can be used as political issue. More abstractly, Sex Robots can be used to reach for the illusion of control.
Transformation	Sex Robots can be used for relationship building and strengthening, sex education, and as a catalyst for new technologies. They could also be used to manipulate the legal system.

Table 7

Q2. How can sex robots be detrimental or beneficial to different industries, actors, or stakeholders?

Beneficial	**Detrimental**
Sex Robots can be lucrative to those who can find creative use for them within their industry.	Sex Robots could very well exacerbate misogynist attitudes if we are not careful.
Sex Robots can be explored as tools within healthcare, for both psychological and physical therapy.	Sex Robots may allow people to enter into sex work that includes penetrative acts.
Sex Robots can be used to strengthen new and old forms of relationships.	Sex Robots can be exploited by hackers or perpetuate deceitful corporate practices.
Sex Robots can be used as a cause to rally around for very different types of people.	

This is, of course, a sensitive topic dealing with human intimacy and connection. Many of these interpretations should be left open to the reader, especially regarding the second question (Table 7). For example, whether people enter into sex work is not necessarily “bad” or detrimental. Though, I think it would be safe to say that the majority of us who enter into this type of work are not fully prepared to acknowledge the long-term repercussions, with reasoning that is often clouded by financial situations. Whether one takes moral issue with sex work should come second to considering vulnerable populations that may need extra protections against exploitation. In a way, this could be another example of how a discussion on sex robot technology deviates towards a conversation on future financial precariousness and Universal Basic Income, like Danaher’s work in 2014[28].

None of these potential risks, or benefits, are guaranteed outcomes. From the perpetuation of gender stereotypes, to eliminating the risk of abuse, neither are certain. Frank & Nyholm write "even if current attitudes towards sex robots among many people interested in having sex with them may have ethically problematic undertones of disregard for consent, there is no guarantee that sex robots will continue symbolizing such sexual relations in the future” (Frank & Nyholm, 311-312). In a similar respect, authors like Kubes and Danaher demonstrate that within the issues we take against sex robots -their misogynistic designs, their objectification of the female body and their capacity to promote sexual violence- is the dormant potential for creating better robots. In 1985, Haraway urged readers, “science and technology provide fresh sources of power, [and] we need fresh sources of analysis and political action” (Haraway, 1985, 87).

While it is often said that the greatest predictor of future behavior is relevant past behavior, tendencies are not inevitabilities. All industries can use reasons to avoid the use of this technology as opportunities for research and change, while framing possible benefits as goals to move towards. Kubes writes "locking the door to dialogue with developers, manufacturers and potential customers of sex robots would throw out the baby with the bathwater." (Kubes, 2019b, 61).

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[28] See Section 2.7.2 Economics and the Sex Work Industry

Sex robot technology is still very, very new and as demonstrated by the cast of participants in this project, it extends far beyond the scope of just robot manufacturers, or even the sex tech industry. I had attempted to reach out to a few manufacturers to participate, but unfortunately did not receive a response in time. As far as future research goes, bringing them into the conversation will certainly be a crucial step. Outside of that, there are immediate opportunities for investigating new forms of design, policy work, and information security positions.

The opportunities for developing sex robot technology from where it stands today lies in opening the technology to other industries and actors. There is fantastic work being done to seamlessly merge virtual reality and haptic technology. In 2020, students at Carnegie Mellon University introduced a low-cost, low-power system called "Wireality" that allows for the tactile sensation of touch to be transmitted when in the virtual world (Fang, et al). Advancements in a new form of materials called 'smart skins' constantly make waves on sex robot forums, where users dream of seeing these materials incorporated into their synthetic partners. These stretchable materials respond to touch, temperature, pressure, and moisture, with compact distributions containing hundreds of sensors per square millimeter (Talbot). Technologies such as these could have a wide range of applications with sex robots, and vice versa. It is my hope that sex robot manufacturers will come to work in harmony with other industries in the coming years, rather than in parallel.

Lastly, the importance of establishing dialogues with multiple stakeholders was stressed throughout these interviews. However, it seems there are few actors with motivation to start these discussions. Perhaps Futures Studies, as an interdisciplinary field, can take this as an opportunity to provide a platform for these conversations. Futurists have a unique ability to enter into different arenas as neutral observers and help people build connections without promoting any single agenda.

With these scenarios we are given a glimpse at possible futures, and shown how factors like design intent, sexual attitudes, and regulation can impact outcomes. The aim of this contribution is to provide useful insight to stakeholders, activists, manufacturers, researchers, and consumers, to rethink their motives and to weigh their contributions to the future of this dynamic technology.

Appendix 1

Table Sources

Table 1: % Positive Response to Public Opinion Polls in Western Countries
Question: Would you consider having sex with a robot?

Year	Overall	Male	Female
2013	9		
2014	17		
2017	16	24	9
2020	22	30	14
2021	25	34	16

2013 - US Study, 1,000 participants

- Yougov. “POLL: Would Sex With A Robot Be Cheating?” HuffPost, Huffington Post, 10 Apr. 2013, updated 06 Dec 2017, www.huffpost.com/entry/robot-sex-poll-americans-robotic-lovers-servants-soldiers_n_3037918.
- Report available at: http://big.assets.huffingtonpost.com/toplinesbrobots.pdf

2014 - UK Study, 2,000 participants

- Press Association. “Third of Britons Fear Rise of Robots, Says Poll.” The Guardian US Edition, Guardian News and Media, 5 May 2014, www.theguardian.com/technology/2014/may/06/third-of-britons-fear-rise-of-robots-poll.

2017 - US Study, 1,000+ participants

- Bame, Yael. “Sex with a Robot? 1 in 4 Men Would Consider It.” YouGov, YouGov, 2 Oct. 2017, today.yougov.com/topics/relationships/articles-reports/2017/10/02/1-4-men-would-consider-having-sex-robot.
- Report available at: https://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/esu3lsfhyf/Copy%20of%20Results%20for%20YouGovNY%20(Robot%20Sex)%20203%2009.27.2017.pdf

2020 - US Study - 1,000+ participants

- Nguyen, Hoang. "In 2020, both men and women are more likely to consider having sex with a robot." YouGov, YouGov, 19 Mar. 2020, today.yougov.com/topics/science/articles-reports/2020/03/19/2020-both-men-and-women-are-more-likely-consider-h
- Report available at: https://docs.cdn.yougov.com/oue6fvx4wu/Results%20for%20YouGov%20RealTime%20(Robot%20Sex).pdf

2021 - Germany Study - 1,000 participants

- Jiang, Emilia. “A Quarter of Young People Say They Would Have Sex with an AI Device.” Daily Mail Online, Associated Newspapers, 11 Feb. 2021, www.dailymail.co.uk/news/article-9250213/A-quarter-young-people-say-sex-AI-device.html.

Table 3: Instances of Human-Robot Marriages

Name/Alias	**Country**	**Model**	**Year**
Geoff Gallagher	Australia	Emma/DS Dolls	2020
Zheng JiaJia	China	Self-Made	2017
"Nelly"	France	Self-Made	2016
"Zoltan	USA	Self-Made	2008

Geoff Gallagher

- Bell, Jess. "'I Fell in Love with a Robot'." *7NEWS.Com.au*, 7NEWS Australia, 25 Dec. 2020, 7news.com.au/lifestyle/relationships/i-fell-in-love-with-a-robot-c-1710777.

Zheng Jia Jia

- Huang, Kristin. "Engineer 'Marries' Robot after Failing to Find a Human Wife." *SCMP*, South China Morning Post, 20 July 2018, www.scmp.com/news/china/society/article/2084389/chinese-engineer-marries-robot-after-failing-find-human-wife.
- Haas, Benjamin. "Chinese Man 'Marries' Robot He Built Himself." *The Guardian*, Guardian News and Media, 4 Apr. 2017, www.theguardian.com/world/2017/apr/04/chinese-man-marries-robot-built-himself.

"Nelly"

- Lutkin, Aimée. "Extremely Relatable Woman Wants To Marry the Robot She Built." *Jezebel*, Jezebel, 23 Dec. 2016, jezebel.com/extremely-relatable-woman-wants-to-marry-the-robot-she-1790451780.
- Rahman, Khaleda. "Woman Reveals She Is in Love with a ROBOT and Wants to Marry It." *Daily Mail Online*, Associated Newspapers, 23 Dec. 2016, www.dailymail.co.uk/femail/article-4060440/Woman-reveals-love-ROBOT-wants-marry-it.html.

"Zoltan"

- Dugdale, Addy. "Technosexual: One Man's Tale of Robot Love." *GIZMODO*, Gizmodo, 25 Mar. 2008, gizmodo.com/technosexual-one-mans-tale-of-robot-love-367698.
- Zoltan's Lab (via web archive, archive date: 7 Jun 2008). web.archive.org/web/20080607225353/http://zoltanslab.co.uk/.

Sources for the other tables can be found within the in-text citations.

Appendix 2

Interview Guides

Caitlin Roper, Kate Davis

Q1. It has been suggested that rather than create victims of sexual violence, sex robots could help already existing ones, by acting as surrogate bodies in sex therapy, to help victims of sexual trauma regain confidence of their own bodies and experience of intimacy before they are ready for a partner. What risks might this pose? What could be the downsides to this proposal?

Q2. What particular dangers might be overlooked by introducing sex robots to socially vulnerable populations (ie. elderly, physically disabled, various mental disorders)? Does denying them -or anyone- access to this technology violate their sexual rights?

Q3. What do you think about deploying sex robots into environments we would never want to send a human sex worker, however willing? For example, Oliver Bendel recently discussed using sex robots in prisons to provide sexual health, improve quality of life, and possibly reduce sexual assault amongst inmates, or, the military, for overseas deployment or on warships, in an effort to not only improve mental well-being for the soldiers, but possibly reduce the demand for local prostitution where soldiers are stationed.

RenderMan, Amie Stepanovich

Q1. It has been suggested that Sex Robots could be used in healthcare and therapeutic environments, such as in elderly care homes, or with disabled people who have difficulty achieving sexual gratification. What unique risks and security concerns do sex robots pose? How do these risks change if sex robots are used in a healthcare setting, like physical therapy or counseling?

Q2. How could government agencies, NGOs, and other groups work with the sex industry to develop effective policies that safeguard consumers, manufacturers, and other stakeholders from threats? How can effective security strategies be enforced in the sex tech industry?

Q3. What new job titles or businesses could you imagine forming around security and sex technology? What new crimes might we see in the future of sex tech?

Ezio DiNucci

Q1. Do you think sex technology, and more specifically sex robots, could be integrated into physical therapy? What would be the benefits and the drawbacks of doing so? What stop measures might be needed?

Q2. It has been suggested that sex robots could be of use for the newly disabled people, or victims of sexual trauma to test their capacity for physical intimacy without the added stress or anxiety of "exposing themselves" to another individual, especially if they don't have a partner to practice with yet. In this scenario, is there anything that might be missing from the picture- What risks or unforeseen consequences might develop?

Q3. What other therapeutic value do you think sex robots could have in the future? Imagine a therapeutic practice in which sex robots are actually incorporated, what would this look like?

Q4. In your contribution to the 2017 Robot Sex book, when you were making comparisons between human sex carers and robots, you mentioned that one of the benefits of using robots, is that they can be, quote, programmed so as to minimize, if not eliminate the risk of abuse. Have you given more thought as to how that could be accomplished?

Dr Marianne Brandon

Q1. Do you think sex technology, and more specifically sex robots, could successfully integrated into rehabilitative therapy for sex offenders? If yes, what would this look like? What would be the unique benefits of using sex robots in this type of treatment? What stop measures might be needed?

Q2. It has been suggested that sex robots could be of use for a variety of people with intimacy issues, stemming from the physical (erectile dysfunction, spinal injuries) to psychological (trauma victims, mentally impaired). As a psychologist and sexual therapist, which conditions would you be most interested in exploring treatment with sex robots?

Q3. What other alternative applications do you think sex robots could have in the future, beyond sexual gratification?

Q4. Within the past few years, there have been so many new possibilities being probed for where sex robots might be valuable, albeit theoretically. As someone who has become part of this community, is there anything that you think is going unaddressed? What crucial conversations do you think are still missing from the dialogue on sex robots?

Ryan Calo

Q1. What are legal concerns future sex robot owners might have?

Q2. When having conversations about robots and the law, or artificial intelligence and policy, is there anything to be mindful of, or anything that changes, when it comes to sex robots?

Q3. There are many who wish to stop the production and sale of sex robots, For example, the Campaign Against Sex Robots in the UK is calling for a European ban of this technology. Do you think such goals are achievable? If sex robots were to be banned, would there be possible legal recourse for users and manufactuers (eg., a violation of rights)?

Q4. This last question is of the imaginary. In your opinion, could sex robots ever achieve legal status, so that they may be held liable in a court of law, participate in marriage, inherit wealth & property etc.? Can you picture a lawyer representing a sex robot, imagine a sex robot having its day in court?

Interview Transcripts are available upon request. Contact: *emilyjaworski@gmail.com*

Interview Guide Privacy Statement

Privacy & Anonymity

You have full right to privacy. If you do not wish to be quoted directly, please indicate one of the following:

- can be quoted directly
- can be quoted anonymously by occupation and field
- cannot be quoted, interview can only be used for analysis and input data to generate scenarios

If no indication is made, your participation will be anonymized by default.

All interviews, recordings and transcripts will only be available to myself and my direct supervisors at TamKang University and will in no way be used for purposes other than analysis for this research.

Appendix 3

Questionnaire Results and Interview Guides

Questionnaire: Sex Robots: Opinions & Thoughts from Disabled Community

Note: -- indicates no answer. Answers in Part 1, 2, & 3 are given in percentages, with the exception of Q10, Q11, representing total marked answers.

Part 1 *General Attitudes*

Q1. Would you consider having sex with a robot?
60% Yes
10% No
30% Maybe

Q2. Would you have a problem recommending a sex robot for somebody else?
80% Yes
20% No

Q3. If recommended by a professional, and of course, given the choice to participate, would you consider using a sex robot as an alternative physical therapy exercise (for muscle training , increasing stamina etc)?
95% Yes
5% No

Part 2 *Sex Robots & Sex Workers*

Q4. Would you consider having sex with a sex care worker or sex surrogate?
60% Yes
25% No
15% Maybe

Q5. Would you be more likely to choose a sex surrogate or a sex robot?
35% Sex surrogate or sex care worker
35% Sex robot
35% Both are acceptable
-- I would choose neither

Q6. Would you consider having sex with a different type of sex worker, such as a prostitute or escort?
45% Yes
30% No
25% Maybe

Q7. Would you be more likely to choose a prostitute or a sex robot?
20% Prostitute or Escort
50% Sex robot
25% Both are acceptable
5% I would choose neither

Part 3 *Sex Robot Design*

Q8. Which is your greater concern?
52.6% Being physically uncomfortable
47.4% Being emotionally uncomfortable
-- Other

Q9. What features would you like to have in a sex robot (Check all that apply)
57% Ability to speak/vocalize pleasure
90% Body warmth
66% Flexibility
43% Capacity to do other tasks
10% Personal assistant features (similar to Siri or Alexa)
38% Facial attractiveness
52% My preferred body type
33% Interchangeable genital attachments (gender dynamic)
38% Vibration
33% Self-lubrication
47% Voice command or remote control
81% Remembers my specific needs, preferences and user settings
10% I would not wish to own or use a sex robot so this question is irrelevant
Participant submitted answer(s):
"Ease of cleaning/maintenance"
"The ability to be an avatar, controlled by another and also the option to have that other person doing the vocalization whether they are trolling the actions or not they need to see what's happening as well but some kind of video monitor"

Q10. Which is the MOST IMPORTANT feature to you, in a sex robot? (Select One)
4 - Ability to speak/vocalize pleasure
2 - Body warmth
-- - Flexibility
-- - Capacity to do other tasks
-- - Personal assistant features (similar to Siri or Alexa)
1 - Facial attractiveness
5 - My preferred body type
4 - Interchangeable genital attachments (gender dynamic)
-- - Vibration
-- - Self-lubrication
1 - Voice command or remote control
2 - Remembers my specific needs, preferences and user settings
2 - I would not wish to own or use a sex robot so this question is irrelevant
Participant submitted answer(s):
“Self cleaning”

Q11. Which is the LEAST IMPORTANT feature to you, in a sex robot? (Select One)
3 - Ability to speak/vocalize pleasure
-- - Body warmth
-- - Flexibility
1 - Capacity to do other tasks
7 - Personal assistant features (similar to Siri or Alexa)
2 - Facial attractiveness
-- - My preferred body type
4- Interchangeable genital attachments (gender dynamic)
1 - Vibration
1 - Self-lubrication
1 - Voice command or remote control
-- - Remembers my specific needs, preferences and user settings
1 - I would not wish to own or use a sex robot so this question is irrelevant

Q12. I would prefer..
60% Single gender robot
-- - Agender robot
40% Interchangeable gender robot
-- - I would not consider a sex robot so this question is irrelevant

Q13. Lastly, when you first heard of the suggestion that sex robots ought to be used to help certain types of disabled people achieve sexual gratification, did you find it offensive or off-putting?10 10% Yes, immediately
5% At first..
24% Not really..
48% No, not at all
10% It's complicated
Participant Submission: I think I'd rather hook up with someone or have sex toys rather than a robot, just unsure about it using it personally

Q14. Additional Comments:

- Privacy is an issue if you have the Avatar feature you can't have social media like Facebook keeping track of what you say and do and then selling that information
- Yes, it was immediately offensive because of the implication (which was borne out in other questions) that disabled people would require robots or paid professionals as compared to the possibility of a conventional relationship
- I am a former sex worker, I also have a physical disability. I think it is a valid option for some people and while I don’t necessarily think it’s for me, I see the value and overall don’t see the difference between that and other sex toys in the right context
- Body preference, I would find that sex robot would have physical disabilities similar to my own - hand, lower arm amputations.
- I'm hyper-sexual so I think I would just put the effort into buying quality toys and finding sexual partners personally
- While I understand your research regards robots, I would be equally interested in the outcomes regarding human partners.
- While it may be great for people that can't find other people for either relationships or sex, it sends the message that people with disabilities are ultimately undesirable and to be cast away to just make do if they want with robots and it may start with people that are too destroyed by their disability but in the end even people with light ones will end up being not wanted by other people, outside of the disabilities if robots reach a level where they are the same as us in most things then humankind is kinda fucked anyway

Works Cited

1. "Customs Act 1901." *Federal Register of Legislation*, Australian Government, 12 July 2017, www.legislation.gov.au/Details/C2017C00219; www.legislation.gov.au/Details/C2019A00072.
2. Abyss Creations. "RealDoll X: Best Realistic Robot Sex Dolls: Silicone Dolls Adults." RealDoll, Abyss Creations, www.realdoll.com/realdoll-x/.
3. Adshade, Marina (2017). "15 Sexbot-Induced Social Change: An Economic Perspective." *Robot sex: Social and ethical implications*, edited by John Danaher and Neil McArthur, MIT Press, 2017, 289-300.
4. Adshade, Marina. "The Proliferation of Sex Robots Will Probably Destroy Marriage-for the Better." *Slate Magazine - FutureTense*, The Slate Group , 14 Aug. 2018, slate.com/technology/2018/08/sex-robots-could-totally-redefine-the-institution-of-marriage.html.
5. AFP (2020). "China's $15 Billion Sex Toy Market Thrives, Thanks to Coronavirus." *Deccan Herald*, DH News Service, 18 Oct. 2020, www.deccanherald.com/international/world-news-politics/chinas-15-billion-sex-toy-market-thrives-thanks-to-coronavirus-903561.html.
6. AFP (2018). "With Massive Gender Gap, Talking Sex Dolls Fill a Void in China." *CTVNews*, CTV News Canada, 4 Feb. 2018, www.ctvnews.ca/sci-tech/with-massive-gender-gap-talking-sex-dolls-fill-a-void-in-china-1.3788798.
7. ai-aitech.co.uk/emma-the-ai-robot
8. Amuda, Yusuff Jelili, and Ismaila B. Tijani. "Ethical and legal implications of sex robot: an Islamic perspective." *OIDA International Journal of Sustainable Development* 3.06 (2012): 19-28
9. Aronsson, Hanna. "Sexual imprinting and fetishism: An evolutionary hypothesis." *Maladapting minds: Philosophy, psychiatry, and evolutionary theory* (2011): 65-90.
10. Austin Institute. "Relationships In America Survey." *The Austin Institute for the Study of Family and Culture*, 2014
11. Australian Border Force. "Man arrested in Canberra over child-like sex doll importation." *Australian Border Force Newsroom*, Australian Border Force, 10 Feb. 2020, newsroom.abf.gov.au/releases/man-arrested-in-canberra-over-child-like-sex-doll-importation
12. Ayres, Martha M., and Anne Woodtli. "Concept analysis: abuse of ageing caregivers by elderly care recipients." *Journal of advanced nursing* 35.3 (2001): 326-334.
13. Bailey-Millado, Rob. "Couple Has 'Real Feelings' for $7K Sex Robot That Saved Their Marriage." *New York Post*, NYP Holdings Incorporated, 14 Apr. 2020, nypost.com/2020/04/14/couple-has-real-feelings-for-7k-sex-robot-that-saved-their-marriage/.
14. Bame, Yael. "Sex with a Robot? 1 in 4 Men Would Consider It." *YouGov*, 2 Oct. 2017, today.yougov.com/topics/relationships/articles-reports/2017/10/02/1-4-men-would-consider-having-sex-robot. (*See Appendix 1*)
15. Baraniuk, Chris. "Ashley Madison: 'Suicides' over Website Hack." *BBC News*, BBC , 24 Aug. 2015, www.bbc.com/news/technology-34044506.
16. Barrett, Deirdre. Supernormal stimuli: How primal urges overran their evolutionary purpose. WW Norton & Company, 2010.
17. Battistoni, Alyssa. "The false promise of universal basic income." *Dissent* 64.2 (2017): 51-62.
18. BBC News. (2018a) "Sex Doll 'Brothel': Xdolls Escapes Paris Council Censure." *BBC News*, BBC, 22 Mar. 2018, www.bbc.com/news/world-europe-43506621.
19. BBC News. (2018b) "Elliot Rodger: How Misogynist Killer Became 'Incel Hero'." *BBC News*, BBC, 25 Apr. 2018, www.bbc.com/news/world-us-canada-43892189.
20. BBC Three, "The Future of Sex? | Sex Robots and Us" *YouTube*, uploaded by BBC Three, 8 Apr. 2018, youtu.be/kGTI2_O9v_Y.
21. Bendel, Oliver (2016). "Sex robots from the perspective of machine ethics." *International Conference on Love and Sex with Robots*. Springer, Cham, 2016.
22. Bendel, Oliver (2021). "Love dolls and sex robots in unproven and unexplored fields of application." Paladyn, Journal of Behavioral Robotics 12.1 (2021): 1-12.
23. Boulding, Elise. "A journey into the future: Imagining a nonviolent world." Peace and Conflict Studies 9.1 (2002): 51-56.
24. Brandon, Marianne. (2021). Interview. Conducted by Emily Jaworski, 2021.
25. Brandon, Marianne. (2019). "Robosexual: The future of human-robot relations." Hosted by WebSummit SAPO. 06 Nov. 2019, www.sapo.pt/websummit/robosexual-the-future-of-humanrobot-relations_e2859cde-d7fd-465c-a7c5-ca36e88fda84

26. Brooks, Gushwell. “The Future is Here: Robotic Humanoid Sex Dolls” NightTalk with Gushwell Brooks. 702.co.za, 6 Oct. 2019.
27. Burr-Miller, Allison, and Eric Aoki. "Becoming (hetero) sexual? The hetero-spectacle of idollators and their real dolls." *Sexuality & Culture* 17.3 (2013): 384-400.
28. Burrell, Bruce P. “I Saw What You Did...or Did I?” *WeLiveSecurity*, ESET, 26 July 2018, www.welivesecurity.com/2018/07/26/i-saw-what-you-did-or-did-i/.
29. Calo, Ryan (2016). "Robots in American law." *University of Washington School of Law Research Paper* 2016-04 2016.
30. Calo, Ryan. Interview. Conducted by Emily Jaworski, 2021.
31. Chadd, Anthony. "DDoS attacks: past, present and future." *Network Security* 2018.7 (2018): 13-15.
32. Cheok, Adrian David, Kasun Karunanayaka, and Emma Yann Zhang. "Lovotics: Human-robot love and sex relationships." *Robot Ethics 2. 0: New Challenges in Philosophy, Law, and Society* 193 (2017): 193-213.
33. Choi, Charles Q. “Humans Marrying Robots? A Q&A with David Levy.” *Scientific American*, Scientific American; Springer Nature America, Inc., 19 Feb. 2008, www.scientificamerican.com/article/humans-marrying-robots/.
34. Chow, Eugene K. “China, Let's Talk About Sex.” *The Diplomat*, The Diplomat Media Inc., 14 Aug. 2017, thediplomat.com/2017/08/china-lets-talk-about-sex/.
35. Christian, M. (2019) “Next Congress on Love and Sex with Robots Set For July.” *Future of Sex*, 7 May 2019, https://futureofsex.net/robots/next-congress-on-love-and-sex-with-robots-set-for-july/.
36. Christian, M. (2020a) “Lonely Lovers Are Turning to Sex Dolls to Satisfy Their Pandemic 'Skin Hunger'.” *Future of Sex*, Future of Sex, 11 Aug. 2020, futureofsex.net/robots/lonely-lovers-are-turning-to-sex-dolls-to-satisfy-their-pandemic-skin-hunger/.
37. Christian, M. (2020b) “Funeral Service Helps Doll Owners Mourn the Loss of Their Plastic Lovers.” *Future of Sex*, Future of Sex, 27 Oct. 2020, futureofsex.net/robots/ funeral-service-helps-doll-owners-mourn-the-loss-of-their-plastic-lovers/.
38. CIA. “Field Listing World Birthrate.” *CIA.gov World Fact Book*, Central Intelligence Agency, 2021, www.cia.gov/the-world-factbook/field/birth-rate/.
39. CIC. “Saudi Arabia Is First Country In The World To Grant A Robot Citizenship: CIC - Saudi Arabia.” *Center for International Communication (CIC)*, Ministry of Media, Saudi Arabia, 26 Oct. 2017, cic.org.sa/2017/10/saudi-arabia-is-first-country-in-the-world-to-grant-a-robot-citizenship/. Press Release.
40. Cincotta, Jack. "Why Supernormal Stimuli are Ruining Human Health: And What to Do About It!.”, 9 Jan. 2021, jackcincotta.com/2021/01/09/why-supernormal-stimuli-are-ruining-human-health-and-what-to-do-about-it/
41. Cole, Byrony, host. "Sex Dolls: How AI-Enabled Real Dolls are Coming to Life (Feat. Matt McMullen of Real Dolls)" *Future of Sex*, season 1, episode 12, 29 Mar. 2017, anchor.fm/futureofsex/episodes/12-Sex-Dolls-How-AI-Enabled-Real-Dolls-are-Coming-to-Life-Feat--Matt-McMullen-of-Real-Dolls-eiq321
42. Cole, Samantha. “The 20-Year Patent on Teledildonics Has Expired.” *Motherboard*, Vice, 17 Aug. 2018, https://www.vice.com/en_us/article/ne55x8/teledildonics-patent-has-expired.
43. Comella, Lynn. “Following Public Outcry, Houston City Council Nixes Robot Brothel.” *Forbes*, Forbes Magazine, 8 Oct. 2018, www.forbes.com/sites/lynncomella/2018/10/08/following-public-outcry-houston-city-council-nixes-robot-brothel/?sh=624bef9771e8.
44. Congostrina, Alfonso L. “Barcelona Abre El Primer Prostíbulo De Muñecas De Silicona De España.” *EL PAÍS*, 3 Mar. 2017, elpais.com/politica/2017/03/02/diario_de_espana/1488469990_782225.html
45. Cox-George, Chantal, and Susan Bewley. "I, Sex Robot: the health implications of the sex robot industry." (2018): 161-164.
46. Critchley, Liam. “What Is Haptic Technology?” *AZoSensors*, AZoNetwork, 5 Dec. 2018, www.azosensors.com/article.aspx?ArticleID=1435.
47. D'arcy, Scott, and Tom Pugh. “Surge in Paedophiles Arrested for Importing Lifelike Child Sex Dolls.” *The Independent UK*, Independent Digital News and Media, 31 July 2017, www.independent.co.uk/news/uk/crime/paedophiles-uk-arrests-child-sex-dolls-lifelike-border-officers-aids-silicone-amazon-ebay-online-nca-a7868686.html.
48. Danaher, John (2014). Sex Work, Technological Unemployment and the Basic Income Guarantee. *Journal of Evolution and Technology* 24 (1):113-130.
49. Danaher, John, and Neil McArthur (2017, a), eds. Robot sex: Social and ethical implications. MIT Press, 2017.

50. Danaher, John (2019, a). "Building better sex robots: lessons from feminist pornography." *AI Love You*. Springer, Cham, 2019. 133-147.
51. Danaher, John (2019, b). "Regulating child sex robots: restriction or experimentation?" *Medical law review* 27.4 (2019): 553-575.
52. Dator, J. (2009). Alternative futures at the Manoa School. *Journal of Futures Studies*, *14*(2), 1–18.
53. Davies, Anna. "People Are Getting Surgery to Look like Their Snapchat Selfies." BBC Three, BBC, 19 Apr. 2018, www.bbc.co.uk/bbcthree/article/9ca4f7c6-d2c3-4e25-862c-03aed9ec1082.
54. Davis, Kate. Interview. Conducted by Emily Jaworski, 2021.
55. Day, Rebecca. "How Revenge Porn Has Been Driving Victims to Suicide Attempts." *Manchester Evening News*, M.E.N. Media, 29 July 2019, www.manchestereveningnews.co.uk/news/greater-manchester-news/how-revenge-porn-been-driving-16635743.
56. Dean, John. "How Sex Robots Could Stop Paedophiles Becoming a Danger to Society." *Mirror UK*, The Mirror, 3 Nov. 2016, www.mirror.co.uk/news/uk-news/sex-robots-could-stop-paedophiles-9121408.
57. DeFren, Allison. "Technofetishism and the Uncanny Desires of ASFR (alt. sex. fetish. robots)." *Science Fiction Studies* (2009): 404-440.
58. DeLamater, John D., and Morgan Sill. "Sexual desire in later life." *Journal of sex research* 42.2 (2005): 138-149.
59. Delvaux, Mady. "Report with recommendations to the commission on civil law rules on robotics." Committee on Legal Affairs, *European Parliament* 27 (2017).
60. DePaulo, Belle. "Around the World, Marriage Is Declining, Singles Are Rising." *Psychology Today*, Sussex Publishers, 17 Aug. 2019, www.psychologytoday.com/us/blog/living-single/201908/around-the-world-marriage-is-declining-singles-are-rising.
61. Devlin, Kate. "Sex Robots | Kate Devlin | TEDxWarwick" *YouTube*, uploaded by TEDx Talks, 04 Apr. 2017, youtu.be/qlNV2fx7iS0.
62. Di Nucci, Ezio (2017). "Sex Robots and the Rights of the Disabled." *Robot sex: social and ethical implications,* Danaher and MacArthur, eds., MIT Press (2017): 73-88.
63. Di Nucci, Ezio (2021). Interview. Conducted by Emily Jaworski, 2021.
64. Dines, Gail, "Gail Dines, Sarah Mah, Yuly Chan, and Cherry Smiley – Feminist Panel – Earth at Risk Conference" *YouTube*, uploaded by Fertile Ground Institute, 20 Feb. 2017, youtu.be/XRcREsLBIVo
65. Döring, Nicola, M. Rohangis Mohseni, and Roberto Walter (2020). "Design, use, and effects of sex dolls and sex robots: scoping review." *Journal of medical Internet research* 22.7 (2020): e18551
66. Döring, Nicola, and Sandra Pöschl. "Sex toys, sex dolls, sex robots: Our under-researched bed-fellows." *Sexologies* 27.3 (2018): e51-e55.
67. Döring, Nicola (2021). "Sex Dolls and Sex Robots." Lykins A.D. (eds) *Encyclopedia of Sex and Gender.* Springer, Cham. 2021.
68. Douthat, Ross. "The Redistribution of Sex." *The New York Times*, The New York Times Company, 2 May 2018, www.nytimes.com/2018/05/02/opinion/incels-sex-robots-redistribution.html.
69. Doyle, Clodagh. "Smart Sex Toys Firm Coughs up $3.75m in Privacy Lawsuit." *The Register*, Situation Publishing, 2 Feb. 2018, theregister.com/2017/03/13/ internet_of_dildos_firm_3_75m_privacy_lawsuit/.
70. Dreyfuss, Emily. "Don't Get Your Valentine an Internet-Connected Sex Toy." *Wired*, Conde Nast, 15 Feb. 2019, www.wired.com/story/internet-connected-sex-toys-security/.
71. EDPB-EDPS. "Joint Opinion 5/2021 on the proposal for a Regulation of the European Parliament and of the Council laying down the harmonized rules on artificial intelligence (Artificial Intelligence Act)" *European Data Protection Board,* 18 Jun. 2021, edpb.europa.eu/system/files/2021-06/edpb-edps_joint_opinion_ai_regulation_en.pdf
72. EFE-EPA, "China Company Enjoys Booming Business with AI Sex Robots." *efe.com*, 24 May 2018, www.efe.com/efe/english/patrocinada/china-company-enjoys-booming-business-with-ai-sex-robots/50000268-3625953.
73. Eichenberg, Christiane, Marwa Khamis, and Lisa Hübner. "The Attitudes of Therapists and Physicians on the Use of Sex Robots in Sexual Therapy: Online Survey and Interview Study." *Journal of medical Internet research* 21.8 (2019): e13853.
74. Eisenstat, Yael. "The Real Reason Tech Struggles With Algorithmic Bias." Wired, Conde Nast, 2 Feb. 2019, www.wired.com/story/the-real-reason-tech-struggles-with-algorithmic-bias/.
75. Elijah, et al. "Sex Robots – a Disturbing Look inside One of the World's Fastest Growing Industries." *Business Leader News UK*, 25 Oct. 2018, businessleader.co.uk/sex-robots-a-disturbing-look-inside-one-of-the-worlds-fastest-growing-industries/53749/.

76. EPRS, UE. "Scientific Foresight study Ethical Aspects of Cyber-Physical Systems." *Scientific Foresight Unit [STOA]. Brussels: Panel para el Futuro de la Ciencia y la Tecnología,*2016, www.europarl.europa.eu/RegData/etudes/STUD/2016/563501/EPRS_STU 282016.
77. EU (2011). Document 32011L0093. "DIRECTIVE 2011/92/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL" *EUR - Lex* OJ L 335, 17.12.2011, p. 1–14, data.europa.eu/eli/dir/2011/93/oj
78. European Parliament (2020). "Priority question for written answer P-003718/2020 to the Commission Rule 138" *Parliamentary Questions*, European Parliament 23 June 2020, www.europarl.europa.eu/doceo/document/P-9-2020-003718_EN.html
79. Fang, Cathy, et al. "Wireality: Enabling complex tangible geometries in virtual reality with worn multi-string haptics." *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 2020.
80. FBI. "Elder Fraud." *FBI.gov*, Federal Bureau of Investigation, 15 June 2020, www.fbi.gov/scams-and-safety/common-scams-and-crimes/elder-fraud.
81. Fergnani, Alessandro (2020). "4 Archetypes, Shel, 2x2: Three Scenario Planning Methods Explained and Compared" *Youtube*, uploaded by Alex Fergnani. 17 Jun 2020, youtu.be/vx2mu5FgsXQ
82. Fergnani, Alessandro, and Mike Jackson. "Extracting scenario archetypes: A quantitative text analysis of documents about the future." *Futures & Foresight Science* 1.2 (2019): e17.
83. Fischer, Benedikt, et al. "Heroin-assisted treatment (HAT) a decade later: a brief update on science and politics." Journal of Urban Health 84.4 (2007): 552-562.
84. Fisher, Mark. *Capitalist realism: Is there no alternative?*. John Hunt Publishing, 2009.
85. Fitzgerald, Cormac. "Up to 5pc of Men Attracted to Children at Some Stage in Their Lives - Research." *Independent.ie*, Independent House Media HUIS, 21 July 2015, www.independent.ie/irish-news/health/up-to-5pc-of-men-attracted-to-children-at-some-stage-in-their-lives-research-31392259.html.
86. Fleischman, Diana. "Uncanny Vulvas." *Jacobite Magazine*, Jacobite, 24 Apr. 2018, jacobitemag.com/2018/04/24/uncanny-vulvas/.
87. Flood, Rebecca. "Living Doll Says 'Plastic Surgery Is BETTER than Sex' despite Nearly Dying." *The Sun*, News Group Newspapers Ltd, 14 Feb. 2019, www.thesun.co.uk/fabulous/8419976/plastic-surgery-doll-boob-sex-dying/.
88. Fong, Mei. "Sex Dolls Are Replacing China's Missing Women." *Foreign Policy*, 28 Sept. 2017, foreignpolicy.com/2017/09/28/sex-dolls-are-replacing-chinas-missing-women-demographics/.
89. Fosch-Villaronga, Eduard, and Adam Poulsen (2020). "Sex care robots: exploring the potential use of sexual robot technologies for disabled and elder care." *Paladyn, Journal of Behavioral Robotics* 11.1 (2020): 1-18.
90. Fosch-Villaronga, Eduard, and Adam Poulsen (2021). "Sex Robots in Care: Setting the Stage for a Discussion on the Potential Use of Sexual Robot Technologies for Persons with Disabilities." *Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction*. 2021.
91. Frank, Lily, and Sven Nyholm. "Robot sex and consent: Is consent to sex between a robot and a human conceivable, possible, and desirable?" *Artificial Intelligence and Law* 25.3 (2017): 305-323.
92. Friedman, George. "The Decline of Births and the Transformation of All Things." *GPF Geopolitical Futures*, Geopolitical Futures, 7 May 2021, geopoliticalfutures.com/the-decline-of-births-and-the-transformation-of-all-things/.
93. Galaitsi, Stephanie Elisabeth, et al. "Sex robots—a harbinger for emerging AI risk." *Frontiers in Artificial Intelligence* 2 (2019): 27.
94. Garber, Megan. "Funerals for Fallen Robots." *The Atlantic*, Atlantic Media Company, 20 Sept. 2013, www.theatlantic.com/technology/archive/2013/09/funerals-for-fallen-robots/279861/.
95. Gee, Tabi Jackson. "Would You Invite a Sexbot into Your Bedroom?" *TimesLIVE*, Sunday Times SA Arena Holdings, 5 June 2017, www.timeslive.co.za/sunday-times/lifestyle/health-and-sex/2017-06-05-would-you-invite-a-sexbot-into-your-bedroom/.
96. Geiger, Dorian. "Canada's Child Sex Doll Trial Raises Uncomfortable Questions About Pedophilia and the Law." *VICE*, Vice Media Group, 25 Feb. 2016, www.vice.com/en/article/kwxj7w/newfoundlands-child-sex-doll-trial-raises-uncomfortable-questions-about-pedophilia-and-the-law.
97. Giusto, Denise and Cecilia Pastorino. "Sex in the Digital Era: How Secure are Smart Sex Toys?" *ESET Research White Papers.* 2021.
98. www.goingyourownway.com
99. Goldfeder, Mark, and Yosef Razin. "Robotic marriage and the law." *JL & Soc. Deviance* 10 (2015): 137.
100. González-González, Carina Soledad, Rosa María Gil-Iranzo, and Patricia Paderewski-Rodríguez. "Human–Robot Interaction and Sexbots: A Systematic Literature Review." *Sensors* 21.1 (2021): 216.

101. Grayson, Julia. Personal Correspondence. 2021
102. Hartley-Parkinson, Richard. “Mother Spent £10,000 to Make Herself Look like a Sex Doll.” *Metro.co.uk*, Associated Newspapers, 21 Aug. 2017, metro.co.uk/2017/08/21/mother-spent-10000-to-make-herself-look-like-a-sex-doll-6866258/.
103. Heilweil, Rebecca. “Why Algorithms Can Be Racist and Sexist.” Vox, Vox Media, 18 Feb. 2020, www.vox.com/recode/2020/2/18/21121286/algorithms-bias-discrimination-facial-recognition-transparency.
104. Hicks, Amber. “Sex Robot Brothel Opens in Japan amid Surge of Men Wanting Bisexual Threesomes.” *Mirror*, Mirror.co.uk, 27 Apr. 2019, https://www.mirror.co.uk/news/weird-news/sex-robot-brothel-opens-japan-14792161.
105. Hilton Jr, Donald L. "Pornography addiction–a supranormal stimulus considered in the context of neuroplasticity." Socioaffective Neuroscience & Psychology 3.1 (2013): 20767.
106. Hinduja, Sameer. “Sextortion.” *Cyberbullying.org*, Cyberbullying Research Center, June 2016, cyberbullying.org/sextortion.
107. Hornyak, Tim. “Sex Robot Roxxxy Looking for Action.” *CNET*, CNET, 11 Jan. 2010, https://www.cnet.com/news/sex-robot-roxxxy-looking-for-action/.
108. Hsu, Jeremy. “Robot Funerals Reflect Our Humanity.” *Discover Magazine*, Kalmbach Media Co., 15 Mar. 2015, www.discovermagazine.com/technology/robot-funerals-reflect-our-humanity.
109. Hussain, Farzan. “Police Captain Suicides After His Email Was Leaked in Ashley Madison Hack.” *HackRead*, Grey Dot Media Group Ltd. , 25 Aug. 2015, www.hackread.com/ashley-madison-hack-police-captain-suicide/.
110. IAI, “The Ethics of Sex Robots | Full Debate | Kate Devlin, Brooke Magnanti, Shahidha Bari, Alan Winfield" *YouTube*, uploaded by The Institute of Art and Ideas, 22 Feb. 2019, youtu.be/dZGh-hzzJQo
111. Ilascu, Ionut. “Hacker Used Ransomware to Lock Victims in Their IoT Chastity Belt.” *BleepingComputer*, Bleeping Computer LLC, 9 Jan. 2021, www.bleepingcomputer.com/news/security/hacker-used-ransomware-to-lock-victims-in-their-iot-chastity-belt/.
112. ILGA. “740 ILCS Biometric Information Privacy Act” *Illinois Compiled Statutes - Illinois General Assembly,* Legislative Information System, www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=3004.
113. Inayatullah, Sohail (1998). "Causal layered analysis: Poststructuralism as method." *Futures* 30.8 (1998): 815-829.
114. Inayatullah, Sohail (2005). "Causal layered analysis—deepening the future." *Questioning the future: methods and tools for organizational and societal transformation,* Tamkang University Press (2005): 1-22.
115. Inayatullah, Sohail (2015). "Ensuring culture does not eat strategy for breakfast: What works in futures studies." World Future Review 7.4 (2015): 351-361.
116. Jecker, Nancy S. "Nothing to be ashamed of: sex robots for older adults with disabilities." *Journal of Medical Ethics* 47.1 (2021): 26-32.
117. Jennings, Rebecca. “Incels Categorize Women by Personal Style and Attractiveness.” *Vox*, Vox Media, 28 Apr. 2018, www.vox.com/2018/4/28/17290256/incel-chad-stacy-becky.
118. Jiang, Emilia. “A Quarter of Young People Say They Would Have Sex with an AI Device.” *Daily Mail Online*, Associated Newspapers, 11 Feb. 2021, www.dailymail.co.uk/news/article-9250213/A-quarter-young-people-say-sex-AI-device.html.
119. Johnson, Peter. "Pornography drives technology: Why not to censor the Internet." *Fed. Comm. LJ* 49 (1996): 217.
120. Kamal, Mudasir, and William J. Newman. "Revenge pornography: Mental health implications and related legislation." *Journal of the American Academy of Psychiatry and the Law Online* 44.3 (2016): 359-367.
121. Katz, Leslie. “Paris Sex Doll 'Brothel' to Stay Open despite Protests.” *C|Net*, CNET, 23 Mar. 2018, www.cnet.com/news/sex-doll-xdolls-brothel-stays-open-despite-protests/.
122. Kelts, Roland. "Private Worlds" *Adbusters.org*, Adbusters Media Foundation, 19 Oct 2009, web.archive.org/web/20120313012346/https://www.adbusters.org/magazine/86/private-worlds.html.
123. www.kiiroo.com
124. Knafo, Danielle. "Guys and dolls: relational life in the technological era." *Psychoanalytic Dialogues* 25.4 (2015): 481-502.
125. Koverola, Mika, et al. "Moral psychology of sex robots: An experimental study‒ how pathogen disgust is associated with interhuman sex but not interandroid sex." *Paladyn, Journal of Behavioral Robotics* 11.1 (2020): 233-249.
126. Kubes, Tanja. (2019a) "New Materialist Perspectives on Sex Robots. A Feminist Dystopia/Utopia?." *Social sciences* 8.8 (2019): 224.

127. Kubes, Tanja. (2019b) "Bypassing the uncanny valley: sex robots and robot sex beyond mimicry." *Feminist philosophy of technology*. JB Metzler, Stuttgart, 2019. 59-73.
128. Kyodo News. “CIA Estimates Taiwan's Fertility Rate to Be World's Lowest.” Kyodo News , KYODO NEWS , 21 Apr. 2021, english.kyodonews.net/news/2021/04/f534b06809b5-cia-estimates-taiwans-fertility-rate-to-be-worlds-lowest.html.
129. Lampen, Claire. “If Your Vibrator Is Hacked, Is It a Sex Crime?” *GIZMODO*, Gizmodo, 31 Oct. 2017, gizmodo.com/if-your-vibrator-is-hacked-is-it-a-sex-crime-1820007951.
130. Lan, Kuo-Wei. *Technofetishism of Posthuman Bodies: Representations of Cyborgs, Ghosts, and Monsters in Contemporary Japanese Science Fiction Film and Animation*. Diss. University of Sussex, 2012.
131. Lee, Bruce Y. “Sex Toy Sales Are Buzzing With Social Distancing From COVID-19 Coronavirus.” *Forbes*, Forbes Magazine, 26 Apr. 2020, www.forbes.com/sites/brucelee/2020/04/26/sex-toys-are-buzzing-with-social-distancing-from-covid-19-coronavirus/.
132. Legislative Services Branch. “Consolidated Federal Laws of Canada, Criminal Code.” *Criminal Code - Justice Laws Website*, Government of Canada, 17 Mar. 2021, laws-lois.justice.gc.ca/eng/acts/C-46/section-163.1.html.
133. Levy, David (2007). "Robot prostitutes as alternatives to human sex workers." IEEE international conference on robotics and automation, Rome. Vol. 14. 2007.
134. Levy, David (2009). Love and sex with robots: The evolution of human-robot relationships. New York, Harper Collins, 2009.
135. Levy, David. "14 The Ethics of Robot Prostitutes." *Robot Ethics: The Ethical and Social Implications of Robotics* (2011): 223.
136. Levy, David (2016). "Why Not Marry a Robot?." International Conference on Love and Sex with Robots. Springer, Cham, 2016.
137. Lino, Valéria Teresa Saraiva, et al. "Prevalence and factors associated with caregiver abuse of elderly dependents: The hidden face of family violence." *Ciencia & saude coletiva* 24 (2019): 87-96.
138. Lomas, Alex (2017). “Screwdriving. Locating and Exploiting Smart Adult Toys.” *Pen Test Partners RSS*, Pen Test Partners, 29 Sept. 2017, www.pentestpartners.com/security-blog/screwdriving-locating-and-exploiting-smart-adult-toys/.
139. Lomas, Alex (2020). “Smart Male Chastity Lock Cock-Up.” *Pen Test Partners* , Pen Test Partners, LLP, 6 Oct. 2020, www.pentestpartners.com/security-blog/smart-male-chastity-lock-cock-up/.
140. Lubeck, Luis. “Sextortion Scammers Still Shilling with Stolen Passwords.” *WeLiveSecurity*, ESET, 30 Apr. 2020, www.welivesecurity.com/2020/04/30/new-sextortion-scam-claims-know-your-password/.
141. Lynn, Maxine. “A Legal Overview of Adult and Childlike Sex Doll Laws in Different Countries.” *Future of Sex*, Future of Sex, 14 Apr. 2020, futureofsex.net/robots/a-legal-overview-of-adult-and-childlike-sex-doll-laws-in-different-countries/.
142. Lynn, Regina. “Ins and Outs of Teledildonics.” *Wired*, Conde Nast, 24 Sept. 2004, www.wired.com/2004/09/ins-and-outs-of-teledildonics/.
143. Mainenti, David C. "Sex robot technology and the Narrative Policy Framework (NPF): A relationship in the making?." *Paladyn, Journal of Behavioral Robotics* 11.1 (2020): 390-403.
144. Maras, Marie-Helen, and Lauren R. Shapiro. "Child sex dolls and robots: more than just an uncanny valley." *Journal of Internet Law* 21.6 (2017): 3-21.
145. Marchant, Gary. *A.I. Thee Wed - Humans Should Be Able to Marry Robots*. 10 Aug. 2015, slate.com/technology/2015/08/humans-should-be-able-to-marry-robots.html.
146. Marcinkowska, Urszula M., and Markus J. Rantala. "Sexual imprinting on facial traits of opposite-sex parents in humans." *Evolutionary Psychology* 10.3 (2012): 147470491201000318.
147. Martin, Alexander J. “FTC Urged to Probe Easily Penetrated Telly-Enabled Teledildonic Toy.” *The Register*, Situation Publishing, 27 Apr. 2017, www.theregister.com/2017/04/27/ftc_urged_to_probe_easily_penetrated_tellyenabled_teledildonic_toy/.
148. Matozzo, Marissa. “Of Course, Sex Toy Sales Are Skyrocketing.” *PAPER*, PAPER Magazine, 19 Mar. 2020, www.papermag.com/sex-toys-sales-2645536137.html.
149. McArthur, Neil, and John Danaher (2017, b). “How Sex Robots Could Help with the Nuts and Bolts of Relationships | John Danaher and Neil McArthur.” *The Guardian*, Guardian News and Media, 3 Oct. 2017, www.theguardian.com/commentisfree/2017/oct/03/sexbots-nuts-bolts-relationships-sex-robots.
150. McArthur, Neil, and Markie LC Twist. "The rise of digisexuality: Therapeutic challenges and possibilities." *Sexual and Relationship Therapy* 32.3-4 (2017): 334-344.

151. McKay, Tom. “Sex Doll-Sharing Service Taqu Suspended After Angering Chinese Communist Party.” *Gizmodo*, Gizmodo, 19 Sept. 2017, gizmodo.com/sex-doll-sharing-service-taqu-suspended-after-angering-1818566310.
152. Michael, Tom. “Sex Robots 'Could Fuel Japan Birth Rate Crisis' as Lonely Men Get AI Girlfriends.” *The Sun*, The Sun, 26 Jan. 2019, https://www.thesun.co.uk/news/8286324/sex-robots-birth-rate-japan/.
153. Miley, Jessica. “Sex Robot Samantha Gets an Update to Say ‘No’ If She Feels Disrespected or Bored.” *Interesting Engineering*, Interesting Engineering, 24 Sept. 2018, https://interestingengineering.com/sex-robot-samantha-gets-an-update-to-say-no-if-she-feels-disrespected-or-bored.
154. Mitaros, Elle. “No More Lonely Nights: Romantic Robots Get the Look of Love.” *The Sydney Morning Herald*, The Sydney Morning Herald, 28 Mar. 2013, www.smh.com.au/technology/no-more-lonely-nights-romantic-robots-get-the-look-of-love-20130327-2guj3.html.
155. Moore, Lane. “This Model Got Plastic Surgery to Look Like a Sex Doll.” *Cosmopolitan*, Cosmopolitan Magazine; Hearst Magazine Media, 9 Oct. 2017, www.cosmopolitan.com/sex-love/news/a31138/model-gets-plastic-surgery-to-look-like-a-sex-doll/.
156. Moran, Michael. “Alien Cathouse Offers 'Blade Runner' Sex Experience with Robots.” *Daily Star UK*, Reach PLC, 1 Nov. 2019, www.dailystar.co.uk/news/weird-news/sex-robot-brothel-using-teledildonics-20765805.
157. Morin, Roc. “Can Child Dolls Keep Pedophiles from Offending?” *The Atlantic*, Atlantic Media Company, 20 Feb. 2018, www.theatlantic.com/health/archive/2016/01/can-child-dolls-keep-pedophiles-from-offending/423324/. -Shin Takagi interview
158. Morse, Jack. “The Internet of Dildos Is Here, and It's Vulnerable as Hell.” *Mashable.com*, Mashable, 2 Feb. 2018, mashable.com/2018/02/01/internet-of-dildos-hackers-teledildonics/.
159. Mortimer, Caroline. “Japanese Man Makes Lifelike Child Sex Dolls for Paedophiles.” *The Independent*, Independent Digital News and Media, 15 Aug. 2016, www.independent.co.uk/news/world/australasia/man-who-makes-child-sex-dolls-for-paedophiles-claims-he-is-an-artist-a7192061.html.
160. Mosbergen, Dominique. “Pastor Outed In Ashley Madison Hack Commits Suicide.” *HuffPost*, Huffington Post, 9 Sept. 2015, www.huffpost.com/entry/pastor-ashley-madison suicide_n_55efe1dbe4b03784e2771e5d.
161. Mozilla. “*Privacy Not Included: A Buyer's Guide for Connected Products.” *Mozilla Foundation*, Mozilla, 2018, foundation.mozilla.org/en/privacynotincluded/about/meets-minimum-security-standards/.
162. Nevejans, Nathalie. European Civil Law Rules in Robotics: Study for the JURI Committee. Policy Department, Citizen’s Rights and Constitutional Affairs, Publications Office, 2016.
163. Nick, Paige. “Is Sex with Robots Written in Our Future?” *Times LIVE*, Sunday Times SA Arena Holdings, 27 Aug. 2017, www.timeslive.co.za/sunday-times/lifestyle/health-and-sex/2017-08-26-is-sex-with-robots-written-in-our-future/.
164. Noto La Diega, Guido. "The European strategy on robotics and artificial intelligence: too much ethics, too little security." *The European Strategy on Robotics and Artificial Intelligence: Too Much Ethics, Too Little Security (July 1, 2017)* 3.2 (2017).
165. NursingHomeAbuseGuide.org
166. Owsianik, Jenna (2015). “'Love and Sex with Robots' Conference Shut Down After Pressure from Authorities.” *Future of Sex*, Future of Sex, 27 Oct. 2015, futureofsex.net/robots/love-and-sex-with-robots-conference-shut-down-after-pressure-from-authorities/.
167. Owsianik, Jenna (2021). “Rising Demand for Sexbots, Remote Sex Toys, and VR Porn amid Health Crisis.” *Future of Sex*, Future of Sex, 25 Jan. 2021, futureofsex.net/sex-tech/rising-demand-for-sexbots-remote-sex-toys-and-vr-porn-amid-health-crisis/.
168. Peck, Emily. “When Your Sexual Abuser Is Also Your Patient.” *HuffPost*, Huffington Post, 2 June 2018, www.huffpost.com/entry/sexual-abuser-patient-home-care-workers_n_5b117c00e4b02143b7cc3941.
169. Peeters, Anco, and Pim Haselager. "Designing virtuous sex robots." *International Journal of Social Robotics* (2019): 1-12.
170. Plafke, James Comments. “The Most Sophisticated Sex Robot Today Is a Product of Healthcare.” *ExtremeTech*, Ziff Davis, LLC, 26 Aug. 2013, www.extremetech.com/extreme/164837-the-most-sophisticated-sex-robot-today-is-a-product-of-healthcare.
171. Pleasance, Chris. “Inside the Exdoll Talking Sex Doll Factory in China.” *Daily Mail Online*, Associated Newspapers, 2 Feb. 2018, www.dailymail.co.uk/news/article-5343555/Call-baby-Talking-sex-dolls-void-China.html.

172. Poulsen, Adam, Eduard Fosch-Villaronga, and Oliver K. Burmeister. "Cybersecurity, value sensing robots for LGBTIQ+ elderly, and the need for revised codes of conduct." *Australasian Journal of Information Systems* 24 (2020).
173. PRNewswire. *The Global Sexual Wellness Market Is Expected to Reach Values of around $39 Billion by 2024*, Cision, 24 Apr. 2019, www.prnewswire.com/news-releases/the-global-sexual-wellness-market-is-expected-to-reach-values-of-around-39-billion-by-2024-300837545.html.
174. Qukula, Qama. "Should we draw the line at Sex Robots? Dr eve discusses the complicated ethics" *The Aubrey Masango Show.* CapeTalk 567AM. 14 Sep. 2018. Radio
175. Ratcliffe, John. "Scenario planning: strategic interviews and conversations." foresight (2002).
176. Raymo, James M., and Hyunjoon Park. "Marriage decline in Korea: Changing composition of the domestic marriage market and growth in international marriage." *Demography* 57.1 (2020): 171-194.
177. reddit.com/r/PurplePillDebate/comments/knr0ci/government_mandated_girlfriends/
178. Ren, ZePing, et al. "How Chinese Fell out of Love with Marriage." *Nikkei Asia*, Nikkei Inc, 22 Mar. 2021, asia.nikkei.com/Spotlight/Caixin/How-Chinese-fell-out-of-love-with-marriage.
179. RenderMan. Interview. Conducted by Emily Jaworski, 2021.
180. Revesz, Rachael. "Paedophiles 'Should Be Prescribed Child Sex Dolls'." *The Independent UK*, Independent Digital News and Media, 2 Aug. 2017, www.independent.co.uk/news/uk/home-news/paedophiles-child-sex-dolls-prescription-stop-attacks-child-protection-stopso-therapists-a7872911.html.
181. Rich, Motoko. "Craving Freedom, Japan's Women Opt Out of Marriage." *The New York Times*, The New York Times, 3 Aug. 2019, www.nytimes.com/2019/08/03/world/asia/japan-single-women-marriage.html.
182. Richardson, Kathleen (2016). "The asymmetrical'relationship' parallels between prostitution and the development of sex robots." *ACM SIGCAS Computers and Society* 45.3 (2016): 290-293
183. Richardson, Kathleen (2018). *Policy Report: Sex Dolls and Sex Robots – A Serious Problem For Women, Men & Society*. CAMPAIGN AGAINST SEX ROBOTS, 5 Aug. 2018, campaignagainstsexrobots.org/ 2018/05/08/policy-report-sex-dolls-and-sex-robots-a-serious-problem-for-women-men-society/
184. Robertson, Jennifer. "Gendering humanoid robots: Robo-sexism in Japan." *Body & Society* 16.2 201): 1-36.
185. Rodriguez, Cecilia. "Sex-Dolls Brothel Opens In Spain And Many Predict Sex-Robots Tourism Soon To Follow." *Forbes*, Forbes Magazine, 1 June 2017, www.forbes.com/sites/ceciliarodriguez/2017/02/28/sex-dolls-brothel-opens-in-spain-and-many-predict-sex-robots-tourism-soon-to-follow/?sh=2bcaab7a4ece.
186. Roper, Caitlin. Interview. Conducted by Emily Jaworski, 2021.
187. Rousi, Rebekah. "Me, my bot and his other (robot) woman? Keeping your robot satisfied in the age of artificial emotion." *Robotics* 7.3 (2018): 44.
188. Ryall, Julian. "Why Fewer Japanese Are Seeking Marriage: DW: 23.06.2016." *DW.COM*, Deutsche Welle, 23 June 2016, www.dw.com/en/why-fewer-japanese-are-seeking-marriage/a-19349576.
189. Ryan, Mike. "Bluetooth: With low energy comes low security." *7th {USENIX} Workshop on Offensive Technologies ({WOOT} 13)*. 2013.
190. Samani, Hooman Aghaebrahimi, and Adrian David Cheok. "Probability of love between robots and humans." *2010 IEEE/RSJ International Conference on Intelligent Robots and Systems*. IEEE, 2010.
191. Santos, Sergi. Personal Correspondence. 2021
192. SBS Dateline "The Japanese robots used for companionship, household tasks and sex." *Youtube,* uploaded by SBS Dateline. 11 Apr. 2017 youtu.be/YzzDLujpat4.
193. Scheutz, Matthias. "The inherent dangers of unidirectional emotional bonds between humans and social robots." *Robot ethics: the ethical and social implications of robotics. The MIT Press, Cambridge* (2012): 205-222
194. Scheutz, Matthias, and Thomas Arnold. (2016) "Are we ready for sex robots?." 2016 11th ACM/IEEE International Conference on Human-Robot Interaction (HRI). IEEE, 2016.
195. Scheutz, Matthias, and Thomas Arnold. (2017) "Intimacy, bonding, and sex robots: examining empirical results and exploring ethical ramifications." *Robot Sex: Social and Ethical Implications*, J. Danaher and N. McArthur, Eds., The MIT Press, London, 2017.
196. Seals, Tara. "Enterprise Security Woes Explode with Home Networks in the Mix." *Threatpost*, ThreatPost, 28 Apr. 2020, threatpost.com/enterprise-security-woes-explode-home-networks/155280/.
197. sexdollofficial.com/faqs/
198. Sharkey, Noel, et al. "Our sexual future with robots: a foundation for responsible robotics consultation report." *Foundation for Responsible Robotics, NL* (2017).

199. Sisson, Paul. “State Regulator Watching Scripps Health Ransomware Attack Closely.” *The San Diego Union Tribune*, San Diego Union-Tribune, 5 May 2021, www.sandiegouniontribune.com/news/health/story/2021-05-05/state-regulator-watching-scripps-ransomware-attack-closely.
200. Skiba, Katherine. (2020a) “Experts Give Advice on Preventing Online Dating Scams.” *AARP*, AARP, 10 Feb. 2020, www.aarp.org/money/scams-fraud/info-2020/online-romance-scams-experts/.
201. Skiba, Katherine. (2020b) “'Sextortion' Scams Spike Amid Stay-at-Home Orders.” *AARP*, AARP, 11 May 2020, www.aarp.org/money/scams-fraud/info-2020/sextortion-scams-rise.html.
202. SonicWall. “SonicWall 2021 Cyber Threat Report”, *SonicWall, Inc*., 2021 www.sonicwall.com/2021-cyber-threat-report/
203. Sparrow, Robert (2017). "Robots, rape, and representation." *International Journal of Social Robotics* 9.4 (2017): 465-477.
204. Sparrow, Robert, and Lauren Karas. "Teledildonics and rape by deception." *Law, Innovation and Technology* 12.1 (2020): 175-204.
205. Stepanovich, Amie. Interview. Conducted by Emily Jaworski, 2021.
206. Stoltzfus, Justin. “Internet of Things (IoT) - Definition from Techopedia.” *Techopedia.com*, Techopedia, 27 Nov. 2020, www.techopedia.com/definition/28247/internet-of-things-iot.
207. Street-Porter, Janet. “Baby Boomers Are Bringing about the next Sexual Revolution with Sex Robots.” *The Independent*, Independent Digital News and Media, 1 Dec. 2017, www.independent.co.uk/voices/sex-robots-are-coming-babyboomers-bringing-about-sexual-revolution-a8087076.html.
208. Sullins, John P. "Robots, love, and sex: the ethics of building a love machine." *IEEE transactions on affective computing* 3.4 (2012): 398-409.
209. Szczuka, Jessica M., and Nicole C. Krämer. "Influences on the intention to buy a sex robot." *International Conference on Love and Sex with Robots*. Springer, Cham, 2016.
210. Talbot, David. “Artificial Skin That Senses, and Stretches, Like the Real Thing.” *MIT Technology Review*, MIT Technology Review, 9 Dec. 2014, www.technologyreview.com/2014/12/09/170133/artificial-skin-that-senses-and-stretches-like-the-real-thing/.
211. Tallet, Olivia P. “'Robot Brothel' Planned for Houston Draws Fast Opposition from Mayor, Advocacy Group.” *CHRON.*, Houston Chronicle, 26 Sept. 2018, www.chron.com/news/article/Robot-brothel-planned-for-Houston-draws-13260032.php.
212. The Local FR. “Paris Sex Doll Brothel ‘Encourages Rape’, but Police Say It’s Legal.” *Thelocal.fr*, The Local France, 20 Mar. 2018, www.thelocal.fr/20180320/paris-councillors-want-citys-first-sex-doll-brothel-shut-down/.
213. *The Sex Robots Are Coming.* Directed by Nick Sweeney, Channel 4 Television Corporation, 2017
214. Theresa, Jordan “OnlyFans & Sex Work” *Youtube.* Uploaded by Jordan Theresa. 05 Jun. 2020 youtu.be/GOKMQWoA210.
215. This Morning. “Holly and Phillip Met Samantha the Sex Robot.” *YouTube,* uploaded by This Morning, 12 Sep. 2017, youtu.be/AqokkXoa7uE.
216. Timmins, Beth. “New Sex Robots Have 'Frigid' Setting Which Allows Men to Simulate Rape.” *The Independent*, Independent Digital News and Media, 21 July 2017, www.independent.co.uk/life-style/sex-robots-frigid-settings-rape-simulation-men-sexual-assault-a7847296.html.
217. Trawka, Paulina, et al. "Sexual dysfunction in elderly men and women." *Journal of Education, Health and Sport* 9.7 (2019): 656-668.
218. True Companion, "True Companions: FAQ." 09 Nov. 2018. *Wayback Machine*. web.archive.org/web/20181109105921/http://www.truecompanion.com/shop/faq
219. U.S. Congress (2017). “H.R. 4655 — 115th Congress: CREEPER Act of 2017.” www.GovTrack.us. 2017. April 13, 2021. www.govtrack.us/congress/bills/115/hr4655
220. U.S. Congress, “H.R. 73 — 117th Congress: CREEPER Act 2.0.” www.GovTrack.us. 2021. April 13, 2021. www.govtrack.us/congress/bills/117/hr73
221. U.S. Congress. “S. 4400— 116th Congress:National Biometric Information Privacy Act of 2020” Congress.gov, *Library of Congress*, 03 Aug. 2020, www.congress.gov/bill/116th-congress/senate-bill/4400/text
222. UN Women, “Progress of the world’s women 2019–2020: Families in a changing world” UNWomen.org, *UN WOMEN,* 2020, www.unwomen.org/en/digital-library/progress-of-the-worlds-women
223. University of Tokyo. “First National Estimates of Virginity Rates in Japan.” *The University of Tokyo*, The University of Tokyo, 8 Apr. 2019, www.u-tokyo.ac.jp/focus/en/press/z0508_00035.html. Press Release.
224. VICE. "First Sex Doll Brothel in Europe" *Love Industries S1 E7* Dec 11, 2018

225. Vincent, Milly. “Swedish Feminists Demand a Ban on Sex Robots Because They Dehumanise Women Just like Pornography.” *Daily Mail Online*, Associated Newspapers, 21 Feb. 2019, www.dailymail.co.uk/news/article-6730555/Swedish-feminists-demand-ban-sex-robots-dehumanise-women-just-like-pornography.html.
226. Walsh, Alistair. “Saudi Arabia Grants Citizenship to Robot Sophia: DW: 28.10.2017.” *DW.COM*, Deutsche Welle, 28 Oct. 2017, www.dw.com/en/saudi-arabia-grants-citizenship-to-robot-sophia/a-41150856.
227. World Association for Sexual Health (WAS). “Declaration of Sexual Rights” *World Association for Sexual Health*, 1999; 2014. worldsexualhealth.net/resources/declaration-of-sexual-rights/
228. Welch, Ashley. “‘Snapchat Dysmorphia’: Selfies, Photo Filters Driving People to Plastic Surgery, Doctors Say.” CBS News, CBS Interactive, 10 Aug. 2018, www.cbsnews.com/news/snapchat-dysmorphia-selfies-driving-people-to-plastic-surgery-doctors-warn/.
229. Wiewiórowski, Wojciech. “The State of Biometrics: Update from the European Data Protection Suervisor” *Biometrics Annual Congress*, 7 Oct. 2020, edps.europa.eu/data-protection/our-work/publications/speeches-articles/state-biometrics-wojciech-wiewiorowski_en; edps.europa.eu/sites/edp/files/publication/20-10-07_edps_biometrics_speech_en.pdf
230. Wiszewska, Agnieszka, Boguslaw Pawlowski, and Lynda G. Boothroyd. "Father–daughter relationship as a moderator of sexual imprinting: a facialmetric study." *Evolution and Human Behavior* 28.4 2007: 248-252.
231. World Health Organization (WHO, 2014). “Gender and Human Rights.” *World Health Organization*, World Health Organization, 28 Nov. 2014, www.who.int/reproductivehealth/topics/gender_rights/sexual_health/en/.
232. World Health Organization (WHO, 2015). *Sexual health, human rights and the law*. World Health Organization, 2015.
233. Wilkinson, Philip, and Neil Philip. *Mythology*. Dorling Kindersley Ltd, 2007.
234. Wynsberghe, A. and Shuhong Li. “A paradigm shift for robot ethics: from HRI to human–robot–system interaction (HRSI).” (2019).
235. Yeoman, Ian, and Michelle Mars. "Robots, men and sex tourism." *Futures* 44.4 (2012): 365-371.